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Wastewater Management for Boise, Eagle, and Ada County, Idaho. 2 Volumes

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Seattle, WA

Feb 81

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16. ABSTRACT

In Ada County, Idaho, the city of Boise and the Eagle Water and Sewer District have initiated wastewater treatment facility planning programs under the Clean Water Grant Program. Grant funds have also been requested by the Ada Planning Association to evaluate wastewater management alternatives in the rural portions of Ada County, particularly in the area southwest of Boise. The Environmental Protection Agency decided that a single environmental impact statement should be prepared to evaluate these proposed wastewater management projects in the Boise area. This environmental impact statement, together with the technical appendix, evaluate the significance of the project-specific impacts from an areawide perspective.

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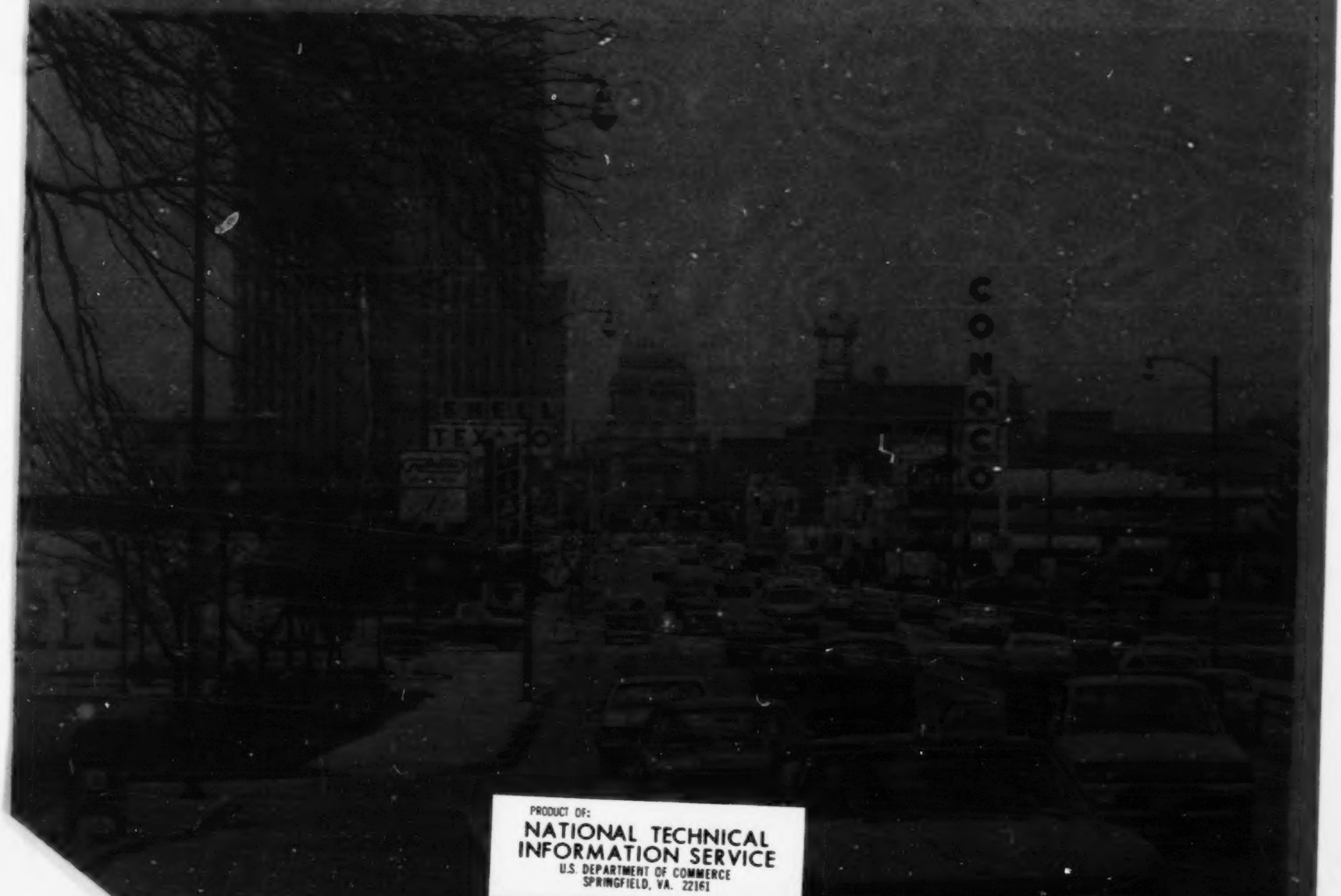
EPA

Environmental Impact Statement

Draft

Wastewater Management for Boise, Eagle, and Ada County, Idaho



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REGION X
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

March 16, 1981

REPLY TO
ATTN OF: M/S 443

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS AND CITIZENS:

We are forwarding for your review and comment this Draft Environmental Impact Statement (DEIS) for Wastewater Management for Boise, Eagle and Ada County, Idaho.

The Environmental Protection Agency (EPA) is preparing this EIS pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969 and implementing Agency regulations. We have prepared the EIS to serve as an informational document on the potential impacts of construction of wastewater treatment facilities for the Cities of Boise and Eagle. Discussions of alternative solutions that have been considered during the planning process are included, as well as measures that may be taken to minimize the environmental impacts.

Availability of the EIS will be announced in the Federal Register on Friday, March 27, 1981, beginning a 45-day comment period. When you have reviewed the DEIS, if you have any comments on it or wish to provide additional information for inclusion in the final EIS, we would appreciate hearing from you before the close of the comment period on May 11, 1981. All comments received will be given consideration in evaluating the alternatives before EPA's decision is made on the proposed project. Comments or questions concerning this Draft EIS should be submitted to the attention of Ms. Norma Young (M/S 443) at the above address. Copies of the EIS are available for review at EPA's Idaho Operations Office in Boise, in the Seattle Regional Office and in the Boise and Eagle public libraries.

A technical Appendix has been prepared to accompany this DEIS. General distribution has not been made of the Appendix; however, copies are available for review in the offices and libraries named above. If you have a pressing need for a personal copy of the Appendix, please send your request to Ms. Young in the Seattle Regional Office.

A public hearing will be held to discuss the Draft EIS at 7:30 p.m. on April 30, 1981 in the Les Bois Room on the third floor of Boise City Hall. We invite you to attend the hearing. All are welcome and will have an opportunity to be heard.

Draft
Environmental Impact Statement

Wastewater Management for
Boise, Eagle and Ada County, Idaho

Prepared by:

U. S. Environmental Protection Agency
Region 10
Seattle, Washington 98101

With technical assistance from:

Jones & Stokes Associates, Inc.
2321 P Street
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FEB 12 1981

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EXECUTIVE SUMMARY

(x) Draft Environmental Impact Statement

( ) Final Environmental Impact Statement

Type of Action: Administrative

Purpose and Need for Action

In Ada County, Idaho, the City of Boise and the Eagle Water and Sewer District (EWSD)* have initiated wastewater treatment facility planning programs under the Clean Water Grant program.

The Ada Planning Association (APA) has also requested grant funds to evaluate wastewater management alternatives in the rural portions of Ada County, particularly in the area Southwest of Boise.

The U. S. Environmental Protection Agency (EPA) has awarded the City of Boise and the EWSD, Step I 201 funds to develop facilities plans for needed improvements in wastewater treatment. The 208 funds were granted to APA for an areawide study of wastewater management.

The intent of the Boise wastewater facilities planning was to develop a management plan to serve the Boise Metropolitan Area through the year 2000. This plan includes a means of improving water quality in the Boise River, and for serving an expanding population base.

The City of Boise is currently served by three wastewater treatment plants: Lander Street, West Boise, and Gowen Field.

The Lander Street plant is currently operating at capacity, both hydraulically and organically. The plant is not designed to remove ammonia.

West Boise treatment plant is currently overloaded hydraulically during the summer months due to high amounts of infiltration/inflow (I/I). Its organic load is far below capacity. It is designed to remove ammonia throughout the year.

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* A list of abbreviations and acronyms is found on page 255.

The Gowen Field plant is underloaded both hydraulically and organically. Effluent quality is generally good throughout the year.

The operation of three dams located on the Boise River above the City of Boise results in large flows in the Boise River during the summer irrigation season and low flows during the winter months. During the winter flow, conditions in the Lander Street wastewater treatment plant may need modifications to meet proposed water quality standards because of ammonia concentrations in the effluent.

In order to meet water quality standards the Lander Street plant will require construction of ammonia removal facilities, and minimum instream flows in the Boise River will be needed during the winter months, or both.

The Lander Street and West Boise wastewater treatment plants need to be expanded, and the capacity of the Gowen Field plant needs to be reevaluated.

The existing EWSD wastewater treatment facility is operating at a 790 dwelling unit limit. Treatment facilities must be upgraded to improve the quality of current discharge and to allow further development options in the Eagle area.

Before additional Section 201 funds for design (Step 2) and construction (Step 3) of a selected project can be awarded, EPA must complete an environmental review of potential impacts of the proposed projects to meet the requirements of the National Environmental Policy Act (NEPA). EPA has prepared this Environmental Impact Statement (EIS) to provide the required review.

In the Boise preliminary draft facilities plan prepared by CH2M Hill, it was assumed that the unincorporated Southwest Community would be served by the West Boise treatment plant. However, during the development of the Southwest Community wastewater management study by APA, a decision was made not to provide sewers to this area.

Data from the Boise facility plan have been adjusted in the DEIS to reflect that decision.

Project Alternatives

Background

Ada County, Idaho is located north of the Snake River in the southwestern part of the state (Figure 1). Encompassing 673,000 acres, most of the county is between 2,500 and 3,300 feet elevation. The northeastern portion of the county includes the slopes of the Boise Front, which rises to elevations of about 5,900 feet. The southern part of the county is primarily desert, with urban and agricultural areas concentrated in the northern half of the county. The northern half of the county is drained by the Boise River, which joins the Snake River along the border between Idaho and Oregon.

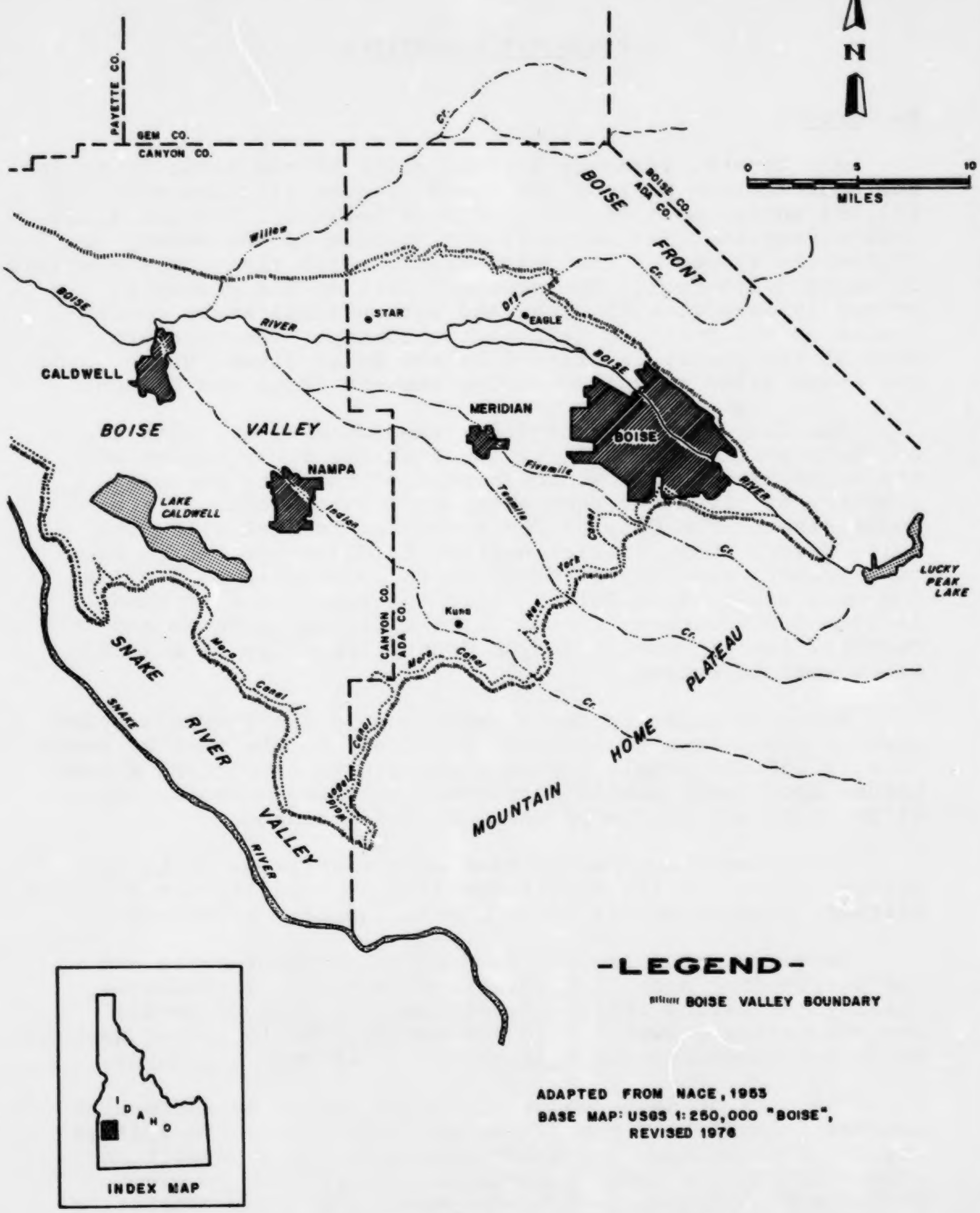
The City of Boise straddles the Boise River, with the northern portions of the city against the lower slopes of the Boise Front. The southern part of the city occupies a series of river terraces (benches) rising south of the Boise River. The City of Eagle is also located along the Boise River, about 9 miles northwest (downstream) from downtown Boise. The City of Meridian is located about 9 miles due west of downtown Boise, while the small Town of Kuna is 13 miles southwest of Boise. The Cities of Nampa and Caldwell in neighboring Canyon County are about 18 and 24 miles west of Boise.

Boise is experiencing a rapid population increase. The sewered population is expected to double in the next 20 years to over 230,000 people. This rapid growth is placing a heavy burden upon local public services, including schools, recreation, fire and police protection, and drainage.

The present wastewater treatment facilities at Landers Street and West Boise are essentially at capacity and effluent discharges occasionally violate water quality standards.

On-site waste disposal is used in parts of Boise and the surrounding area, and this is a threat to groundwater quality. Existing facilities will not be able to handle new population growth in the area without violation of National Pollutant Discharge Elimination System (NPDES) standards.

The City of Eagle and vicinity is served by wastewater treatment facilities managed by the EWSD. These facilities are not able to meet new NPDES standards. New population growth within the area is expected to more than double by 2000 and will require additional waste treatment facilities in order to avoid continuing violation of waste discharge criteria.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0 5 10
MILES
PAYETTE CO.
GEM CO.
CANYON CO.
BOISE CO.
ADA CO.
BOISE FRONT
Willow
Cr.
BOISE
RIVER
STAR
Dry
Cr.
EAGLE
CALDWELL
BOISE VALLEY
MERIDIAN
BOISE
NAMPA
LAKE CALDWELL
Indian
Fivemile
Tenmile
Canal
New York
Cr.
RIVER
LUCKY PEAK LAKE
Kuna
Mora Canal
CANYON CO.
ADA CO.
Canal
PLATEAU
MOUNTAIN HOME
SNAKE RIVER VALLEY
SNAKE RIVER
IDAHO
INDEX MAP
-LEGEND-
BOISE VALLEY BOUNDARY

ADAPTED FROM NACE, 1953
BASE MAP: USGS 1:250,000 "BOISE",
REVISED 1976

FIGURE 1. REGIONAL SETTING

The APA has conducted a Southwest Community wastewater management plan financed under Section 208 of the federal Clean Water Grant which has culminated in adoption of a rural lifestyle land use plan which limits growth in that area.

New growth, therefore, is expected to occur in other areas of the county including those areas sewered by Boise and by Eagle. This growth must be anticipated and the required services, including wastewater treatment, must be provided by the districts in which growth will occur.

No Action

Federal regulation (40 CFR, Part 6) requires that all EISs consider the impacts of continued use of the wastewater treatment and disposal methods currently serving area residents. This is the no-action alternative.

For Boise this would mean that the existing Lander Street and West Boise plants would continue to operate as is, with the potential for ammonia toxicity, residual chlorine toxicity and reduced oxygen levels during low river flows. There is no capacity to handle additional population growth in the area. Most of the Boise area residents using septic tanks would continue to do so with potential surface and groundwater contamination. The city would be unable to extend central wastewater service to new residential, commercial or industrial development.

For the EWSD the no-action alternative would mean continuing violation of the District's NPDES discharge permit and would not provide for any improvement in the quality of effluent being discharged into the Boise River. New development would have to rely on the use of septic tanks.

Alternatives Available to EPA

EPA's principal roles in this project are to provide an environmental review and to administer design and construction funds available through Section 201 of the Clean Water Act. EPA has a number of options available in acting on the grant applicants' (City of Boise and EWSD) request for federal funding of the wastewater project. In terms of the structural configuration of treatment and disposal processes, EPA could offer funds for a combination of processes not currently included in a single alternative in the facilities plan. Although this is unlikely, it could be done for environmental or economic reasons. In terms of administrative actions, after review of the facilities plan and the environmental impacts of construction of the proposed project, EPA could: 1) fund the project as described and recommended by the applicants, 2) not fund the project, 3) provide funding at a level below that requested by the applicants, 4) provide funding in excess of the level requested by the applicants, 5) fund the project in stages, or 6) fund the project only after attaching certain conditions to the grant award. These administrative actions would be in response to regulatory requirements, funding availability, environmental concerns or some combination of all three.

If EPA determines that the projects selected by the City of Boise and the EWSD were excessive in cost or would result in adverse environmental impacts which could be mitigated, it may wish to remedy these problems by placing conditions on the award of subsequent grants rather than supporting a different alternative or modifying the funding. EPA administrative procedures allow this mitigation approach and place the burden of action on the grant applicant. Grant conditions can include specific monitoring requirements, requests for supporting ordinances, or a variety of other controls on the construction and operation of wastewater treatment and disposal facilities.

Other Alternatives Considered

A number of other alternatives were considered by the Boise facility plan engineers. These included land disposal of treated effluent, expanding Gowen Field facilities, landfill disposal of sludge, various locations of interceptors, possible river crossings, river flow augmentation, sludge treatment and transport, aerobic digestion, and location of sludge disposal sites.

These were considered in preliminary studies but were dropped because of adverse cost or environmental effects.

City and Facilities Plan Recommendations

The EWSD has recommended that Alternative D (rapid infiltration and discharge to the Boise River) be implemented. The Boise facility plan engineers have recommended that the Lander Street plant be modified to meet discharge requirements with no increase in capacity; also, that the West Boise treatment plant be expanded in a two-stage approach, including anaerobic digestion and disposal of liquid sludge by agricultural use by pipeline transport to the state prison farm.

Description of Alternatives

Boise (Figure 2).

Treatment.

- Lander Street plant to remain at present capacity with minor modifications to meet effluent discharge requirements. These modifications include dechlorination and more efficient use of methane gas.
- West Boise plant to have major facilities expanded in a two-stage approach. First stage in 1983 would add 10.7 MGD of capacity, increasing total capacity to 17 MGD. Three sludge digestion alternatives would be considered. These include continued aerobic digestion; continued aerobic digestion with modification to simplify conversion to anaerobic digestion; and conversion to anaerobic digestion. The second stage would include construction of an equal capacity plant (17 MGD) adjacent to the present and Stage 1 expansion facilities.
- Three basic sludge management alternatives have been defined:

  Digested (liquid) sludge truck transport to agricultural use/disposal.

  Digested (liquid) sludge pipeline transport to agricultural use/disposal.

  Digested sludge (dewatered) with truck transport and landfill disposal.
- Three alternative sludge pipeline corridors (Figure 6)
- Four alternative interceptor alignment plans have been studied for the North Boise area. These include four plans as shown in Figure 4.
- Four alternative alignments and two additional routings were studied for the South Boise area (Figure 5).

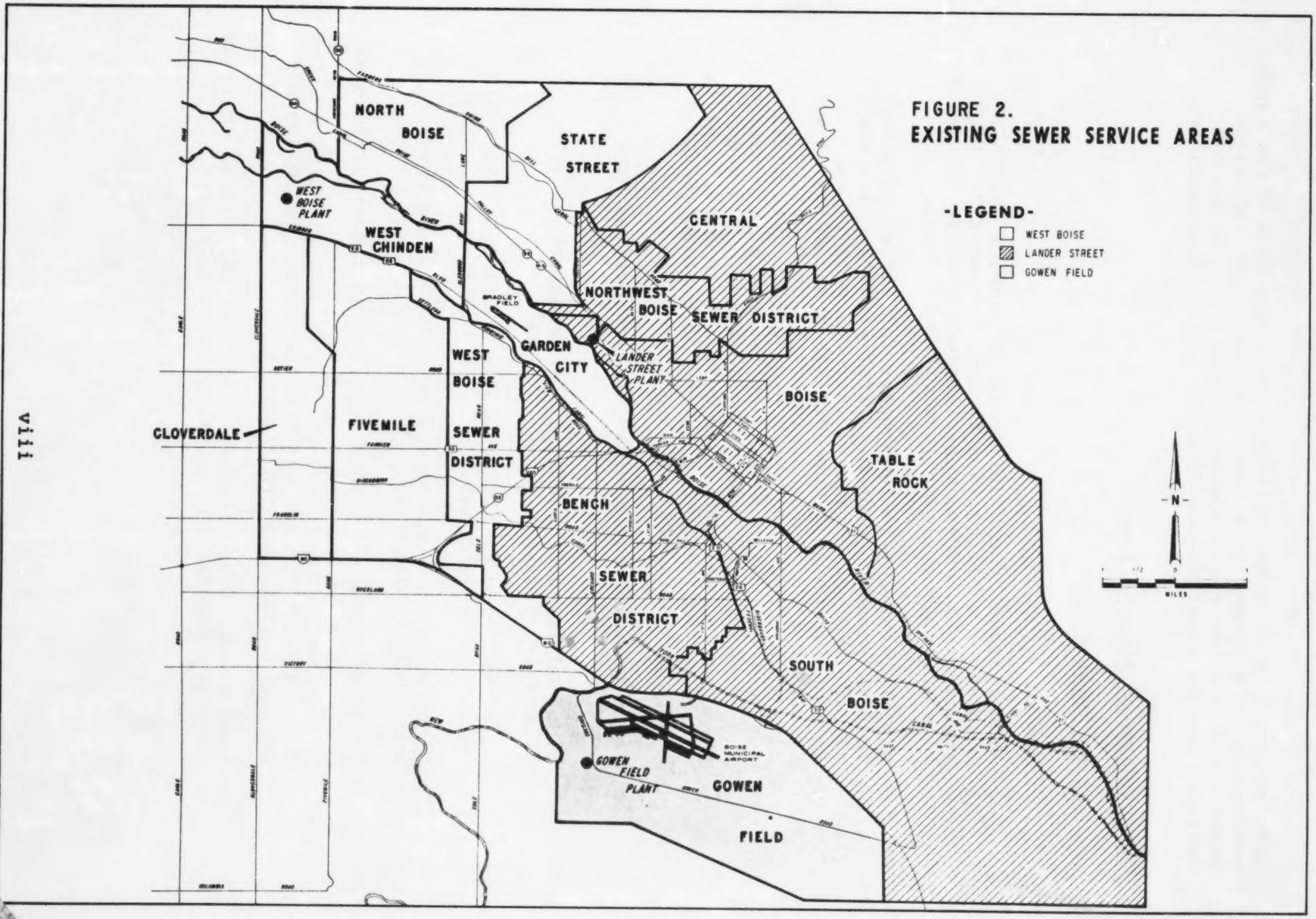


FIGURE 2.
EXISTING SEWER SERVICE AREAS

-LEGEND-
☐ WEST BOISE
▨ LANDER STREET
☐ GOWEN FIELD
-N-
1/2
0
MILES
NORTH BOISE
STATE STREET
CENTRAL
NORTHWEST BOISE SEWER DISTRICT
WEST BOISE PLANT
WEST CHINDEN
BRADLEY FIELD
GARDEN CITY
LANDER STREET PLANT
BOISE
TABLE ROCK
WEST BOISE SEWER DISTRICT
CLOVERDALE
FIVEMILE
BENCH SEWER DISTRICT
SOUTH BOISE
BOISE MUNICIPAL AIRPORT
GOWEN FIELD PLANT
GOWEN FIELD

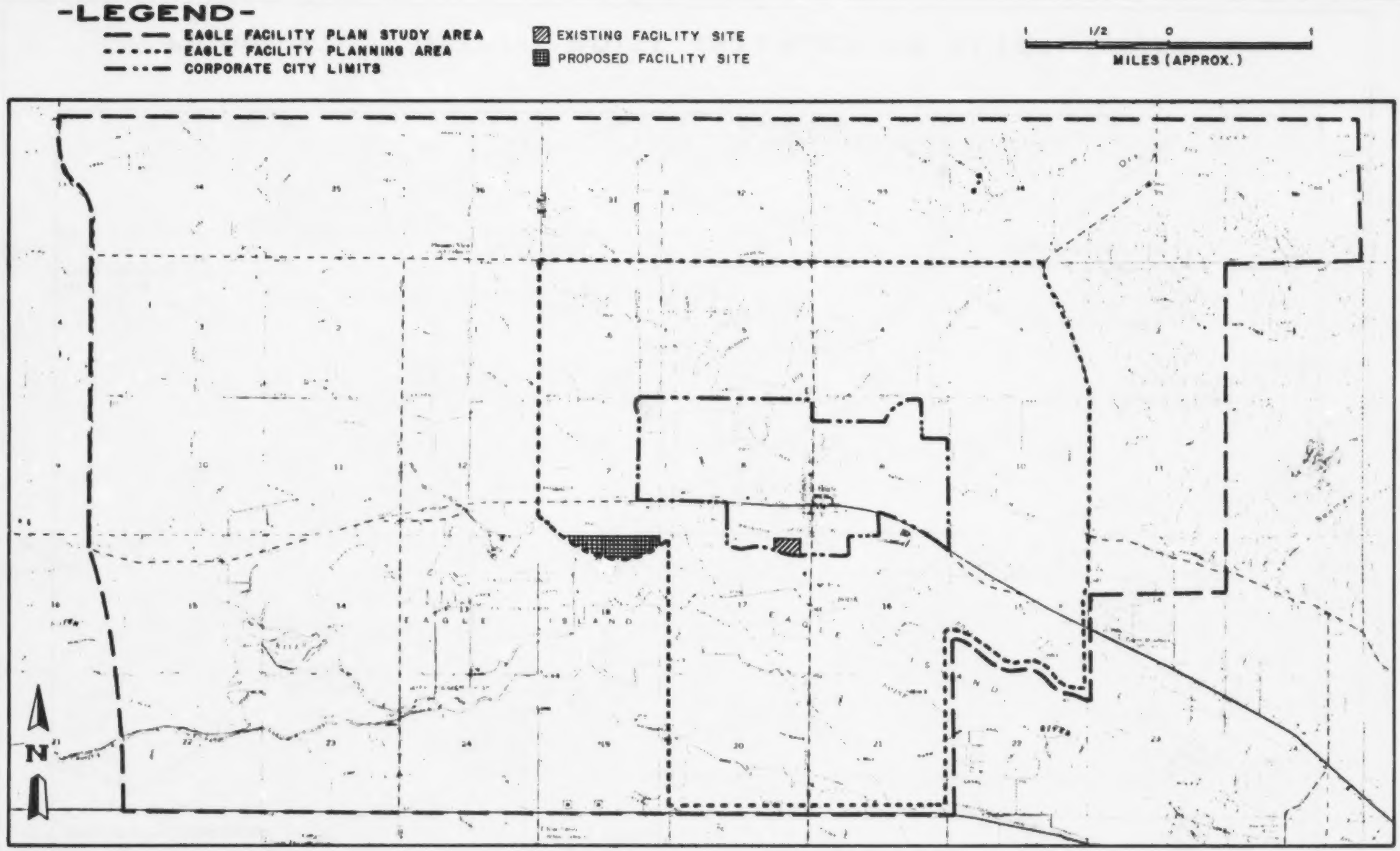

-LEGEND-
EAGLE FACILITY PLAN STUDY AREA
EAGLE FACILITY PLANNING AREA
CORPORATE CITY LIMITS
EXISTING FACILITY SITE
PROPOSED FACILITY SITE
1
1/2
0
1
MILES (APPROX.)
EAGLE ISLAND
EAGLE
N

FIGURE 3. FACILITY PLANNING AREAS FOR THE EAGLE WATER AND SEWER DISTRICT

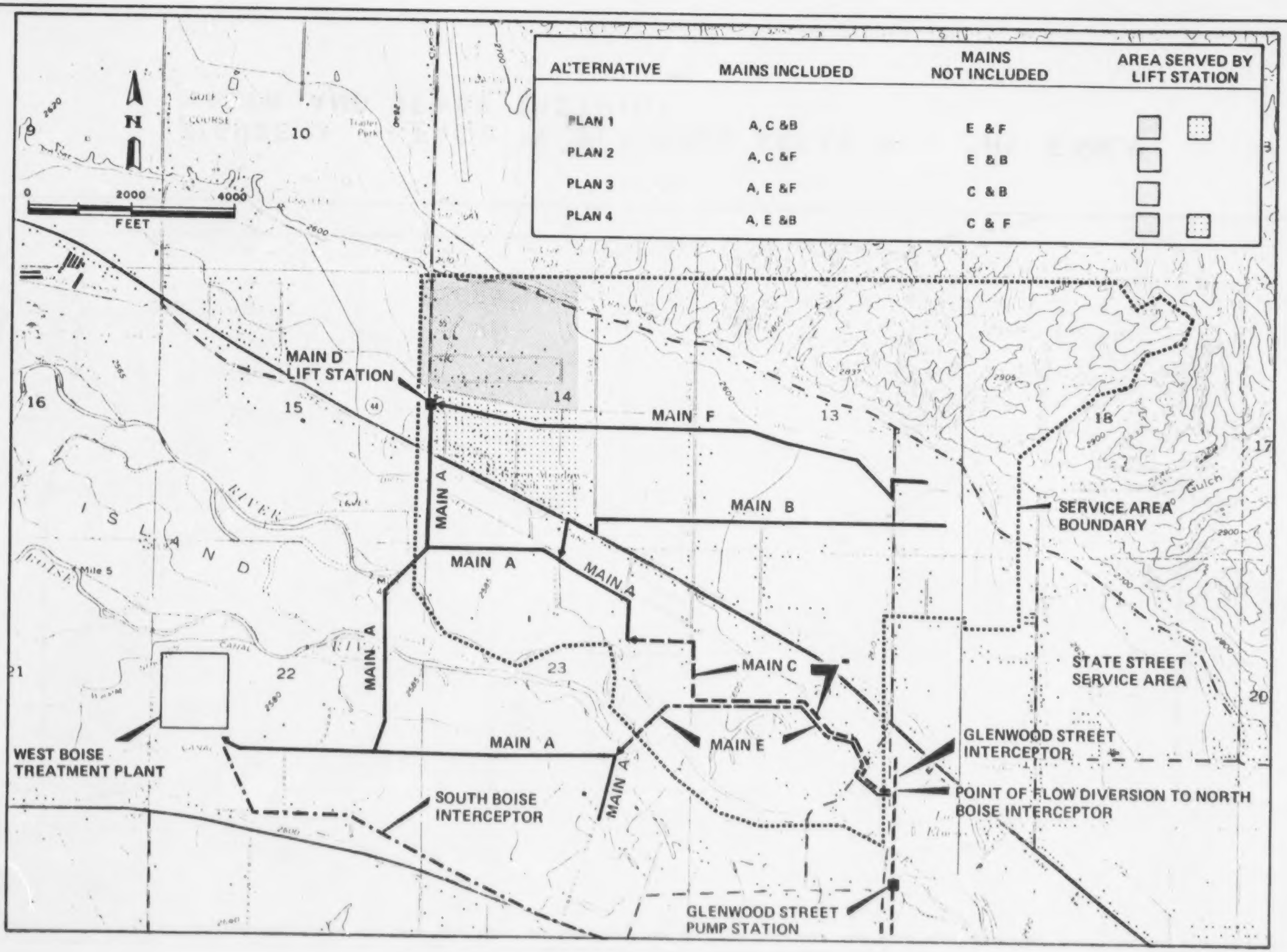

ALTERNATIVE
MAINS INCLUDED
MAINS NOT INCLUDED
AREA SERVED BY LIFT STATION
PLAN 1
A, C &B
E &F
PLAN 2
A, C &F
E &B
PLAN 3
A, E &F
C &B
PLAN 4
A, E &B
C & F
N
0
2000
4000
FEET
GOLF COURSE
Trailer Park
10
9
16
15
14
13
18
17
20
21
22
23
MAIN D LIFT STATION
MAIN F
MAIN B
MAIN A
MAIN C
MAIN E
ISLAND
RIVER
BOISE
Mile 5
Gulch
SERVICE AREA BOUNDARY
STATE STREET SERVICE AREA
GLENWOOD STREET INTERCEPTOR
POINT OF FLOW DIVERSION TO NORTH BOISE INTERCEPTOR
GLENWOOD STREET PUMP STATION
SOUTH BOISE INTERCEPTOR
WEST BOISE TREATMENT PLANT

FIGURE 4. NORTH BOISE INTERCEPTOR ALTERNATIVES

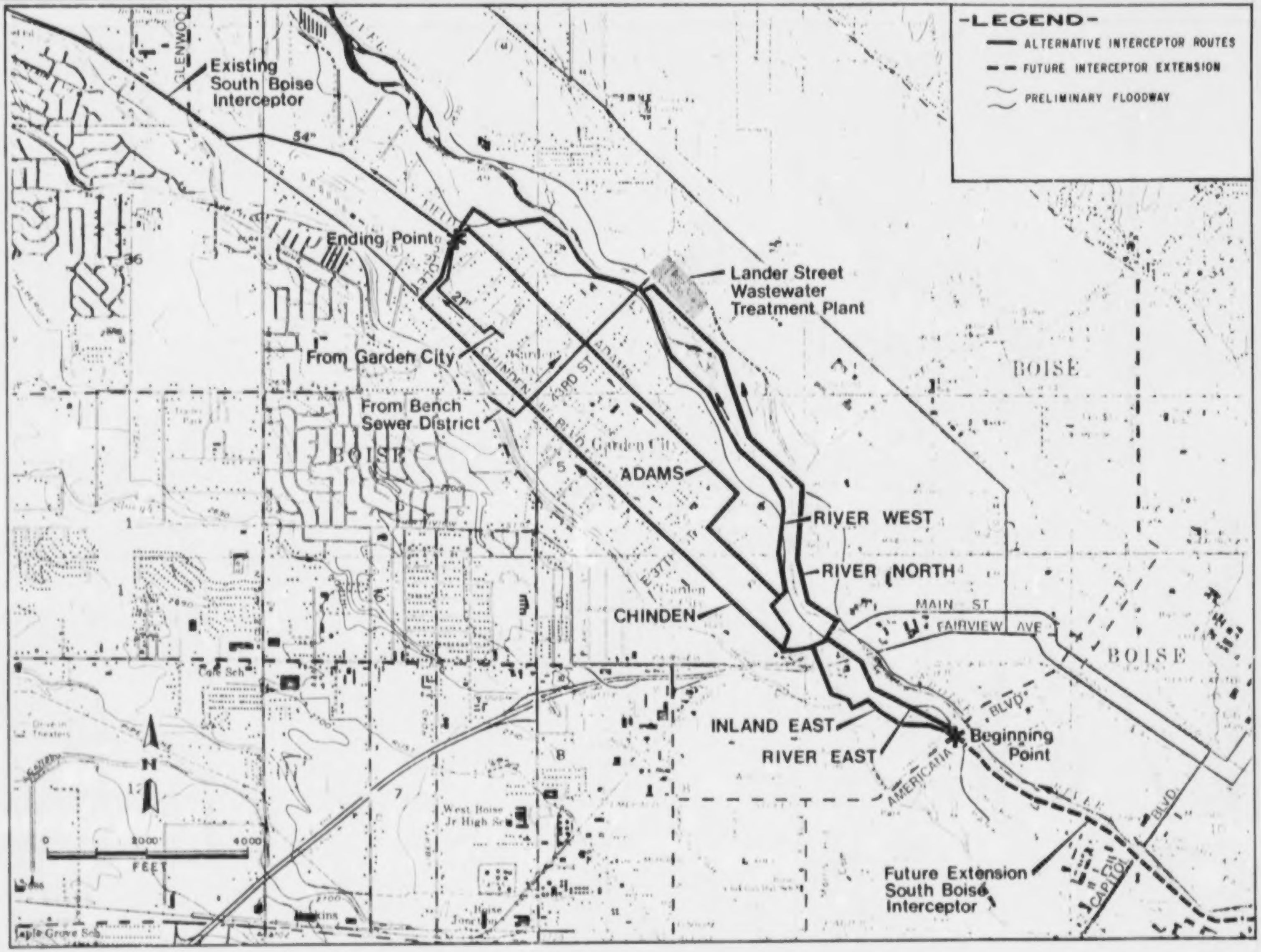

-LEGEND-
ALTERNATIVE INTERCEPTOR ROUTES
FUTURE INTERCEPTOR EXTENSION
PRELIMINARY FLOODWAY
Existing South Boise Interceptor
54"
GLENWOOD
Ending Point
21"
Lander Street Wastewater Treatment Plant
From Garden City
From Bench Sewer District
CHINDEN
43RD ST
ADAMS
Garden City
BOISE
ADAMS
RIVER WEST
RIVER NORTH
CHINDEN
MAIN ST
FAIRVIEW AVE
BOISE
INLAND EAST
RIVER EAST
Beginning Point
AMERICANA
BLVD
CAPITOL
Future Extension South Boise Interceptor
West Boise Jr High Sch
N
0
2000'
4000
FEET

FIGURE 5. ALTERNATIVE SOUTH BOISE INTERCEPTOR ROUTES

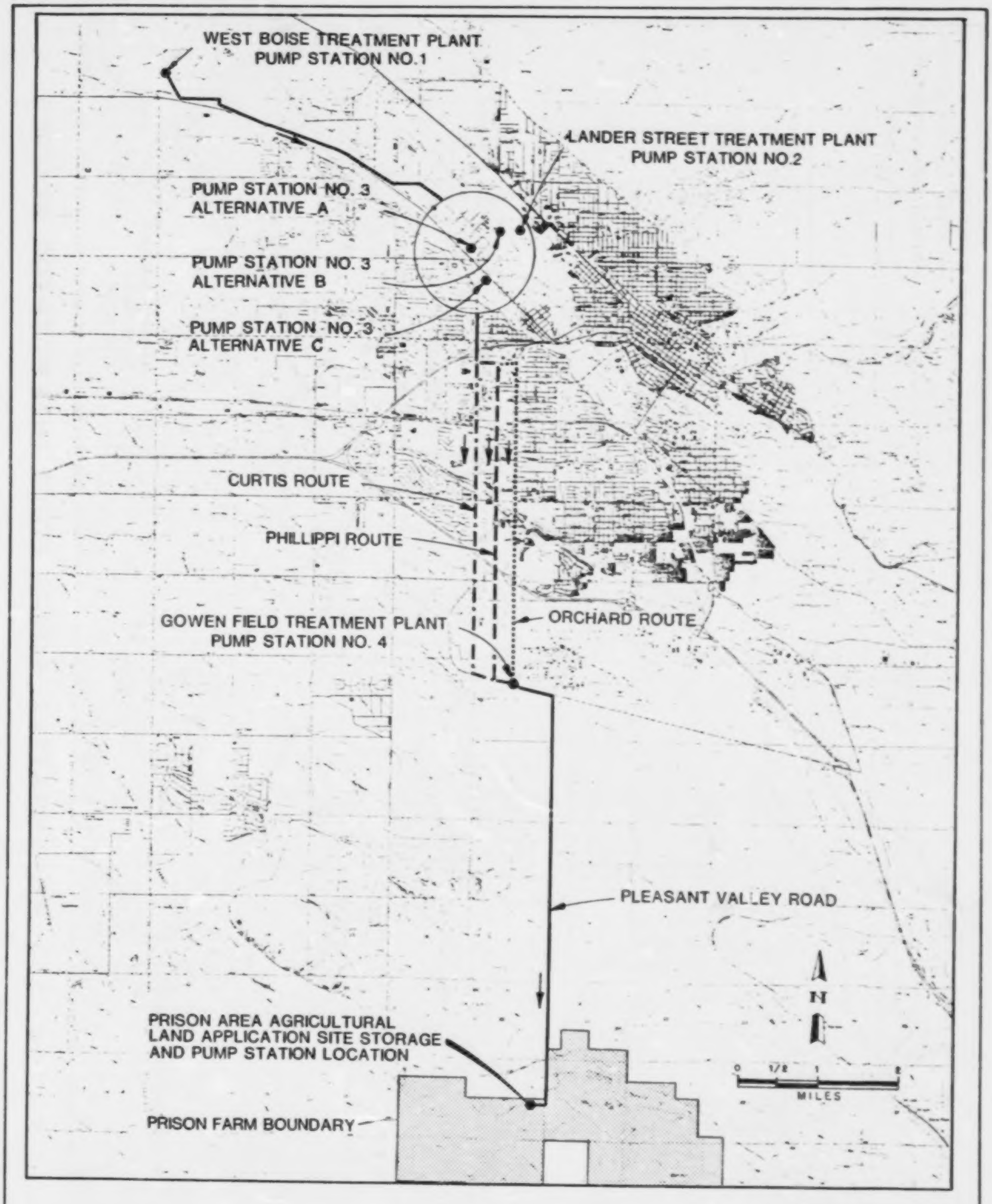

WEST BOISE TREATMENT PLANT
PUMP STATION NO.1
LANDER STREET TREATMENT PLANT
PUMP STATION NO.2
PUMP STATION NO. 3
ALTERNATIVE A
PUMP STATION NO. 3
ALTERNATIVE B
PUMP STATION NO. 3
ALTERNATIVE C
CURTIS ROUTE
PHILLIPPI ROUTE
GOWEN FIELD TREATMENT PLANT
PUMP STATION NO. 4
ORCHARD ROUTE
PLEASANT VALLEY ROAD
PRISON AREA AGRICULTURAL
LAND APPLICATION SITE STORAGE
AND PUMP STATION LOCATION
PRISON FARM BOUNDARY
N
0
1/2
1
2
MILES

FIGURE 6. SLUDGE PIPELINE ROUTING & LAND APPLICATION SITE

Eagle (Figure 3). Five waste treatment alternatives have been studied. These include:

- Alternative A - oxidation ditch and discharge to the Boise River.
- Alternative B - pump to West Boise treatment plant.
- Alternative C - land application by irrigation.
- Alternative D - rapid infiltration with discharge to the Boise River.
- Alternative E - on-site disposal.

Southwest Community (Figure 1). Three wastewater treatment alternatives were developed by the APA Southwest waste management program. These include:

- Central wastewater collection system and treatment at the West Boise treatment plant.
- Central wastewater collection and treatment at a Southwest community wastewater treatment plant with land disposal of effluent.
- Wastewater collection and treatment at community lagoons with land disposal of effluent at separate sites or a common site.

Three variations to these alternatives were evaluated: Plan A - urban growth, Plan B - urban reserve, and Plan C - rural lifestyle. The Board of Ada County Commissioners in August 1980, adopted Plan C - rural lifestyle land use plan allowing for 1 unit per 5 acres. As a result of that decision, the use of individual on-site surface disposal systems became the only feasible wastewater management alternative for the Southwest community.

Operation Management Program Alternatives.

- Mandatory operation and maintenance program.
- Volunteer/mandatory operation and maintenance program.
- Volunteer operation and maintenance program.
- No-action program.

Impacts of the Proposed Alternatives

The environmental impacts and potential mitigation measures for the project alternatives are summarized in the following tables. Only the more significant or potentially significant impacts have been summarized.

Following the tables is a short narrative summary of these impacts.

The mitigation measures listed are possible methods of avoiding or reducing the severity of adverse impacts. Mitigation measures are not necessarily those that will be implemented should a project be constructed. The adopted mitigation measures will be included in EPA's Record of Decision on the project, which will be prepared after the completion of the Final EIA. EPA will not be responsible for all mitigations required. Local, regional, and state agencies will be called upon to initiate those mitigation measures that are within their respective functional capacities.

Summary Comparison of Alternatives

Under the no-action alternative, presently unsewered areas will continue to constitute a threat to surface and groundwater quality. This could result in fish mortality in the Boise River, particularly under low flow conditions and to potential public health problems for groundwater contamination by septic tanks.

Upgrading the Boise Lander Street plant will remove water quality problems associated with chlorine and ammonia now entering the Boise River.

Modifying the West Boise plant to include anaerobic digestion and increased hydraulic capacity will permit the sewering of areas not now sewered, as well as accommodating new growth.

The anaerobic digestion will permit a significant reduction in net energy consumption due to methane recovery and use in facilities equipment.

Installation of the proposed North Boise and South Boise interceptor lines will accommodate growth as well as provide for sewering of areas using on-site treatment. The most significant potential impacts will result from river crossings, crossing Eagle Island, and destruction of riparian habitat in areas near the Boise River bank. These impacts may be mitigated by controlled and approved construction methods, and by revegetation and by limitations on land use within the pipeline corridors.

Table 1. Impacts
(Landers Street, West Boise, and Eagle Treatment Plants)

Area of Impact	Description of Impact	Possible Mitigation Measures
Direct		
Groundwater quality	Eventual elimination of on-site wastewater disposal system.	None
	Centralized treatment capacity for new residents.	None
Surface water quality	Elimination of wastewater discharges to the Boise River that violate state and federal waste discharge requirements assuming dependable water flows.	Negotiate dependable water flows from Lucky Peak Reservoir.
Sludge disposal area health threat	No significant impact upon public health or groundwater as proposed and described in Boise facilities plan. Eagle disposal method has not been described.	None
Costs	No significant difference in cost between present aerobic digestion and anaerobic digestion in the West Boise plant.	None
	No significant difference in cost between North Boise interceptors.	
	Truck transport of liquid or dewatered sludge is 4-6 times as expensive as pipeline transport.	Convert to pipeline transport of sludge.
	Boise user charge for average domestic household system will increase from $7.70 per month to approximately $8.60 per month for Stage 1 improvements, and to $9.20 per month for Stage 2.	None
Growth		
Growth implications population increase	Approximately 214,000 population will be accommodated on Boise sewer system. Net increase of 88,000 by year 2000.	Encourage infill and increased urban densities.
	Eagle would increase from approximately 4,500 to 13,300, an increase of 8,800.	Limit amount of urban development.
	Loss of agricultural land.	Increase density of urban development. Allow development only on land not suited for agricultural use. Preserve existing agricultural uses. Limit expansion or extension of urban services. Strengthen competitive position of agriculture. Use tax incentive to encourage agricultural uses or discourage urban uses of agricultural lands.

Area of Impact	Description of Impact	Possible Mitigation Measure
	Decreased air quality	Develop and implement air quality maintenance plan. Carpooling, bicycle routes, mass transit, etc., as now being studied by APA.
	Vegetation, fish and wildlife will be adversely affected by loss of habitat due to development, and by disturbance due to humans and pets in and near developed areas or increased recreational areas.	Plan urbanization and recreation within Barber Park to minimize bald eagle disturbance. Direct development away from long billed curlew nesting areas. Implement drainage and runoff control measures to prevent sediment from entering streams and rivers.
	Drainage - as increased development occurs there will be increased runoff, sedimentation and potential flooding as a result of construction and changes in drainage patterns.	Designate agency to implement countywide drainage planning and facility maintenance and administration. Seek legislative clarification to provide full drainage authority and funding. Develop, adopt, and implement consistent drainage criteria. Prepare, adopt and implement drainage master plans.
Resource and energy use	Population increase in sewered areas will use energy in the residential and transportation sectors and stimulate consumption in the industrial and commercial sectors.	Institute energy conservation measures.
Traffic	Population growth supported by increased wastewater treatment capacity will add traffic loads to the existing roadway system.	Develop local traffic plan considering air quality attainment standards.
Southwest area groundwater	There would be no significant adverse impacts under rural lifestyle plan.	Establish regular monitoring programs of shallow and deep groundwater quality. Implement APA comprehensive plan on-site waste management program.
Construction Related		
Noise, dust and erosion	Short-term impacts from construction of interceptors, and sludge pipelines (river north, river west, and Adams Street).	Equip internal combustion engines with adequate mufflers. Limit construction to daylight working hours. Use normal dust control measures. Revegetate exposed area following construction.
	No significant adverse impacts from Eagle pipeline construction.	None

Area of Impact	Description of Impact	Possible Mitigation Measures
Vegetation and wildlife	Proposed Eagle alternative projects will eliminate significant amounts of important riparian wildlife habitat.	EPA and City of Eagle will evaluate alternative sites that may avoid or lessen the impact upon the existing wetland. If no feasible alternative exists, EPA will propose mitigation measures to be coordinated with the U. S. Fish and Wildlife Service.
	Proposed South Boise interceptor routes located near the river would destroy riparian habitat. River north and river west would destroy 5-7 acres. Proposed North Boise interceptor routes would have significant adverse impacts on vegetation where Main A would cross Eagle Island to the river and where Main E would cross the river. A great blue heron rookery would be disrupted.	Locate pipelines to avoid riparian habitat where feasible. Other land uses should be avoided in pipeline corridors which would prevent re-establishment of vegetation or result in disturbance by humans.
Fisheries	All of the Boise interceptor and sludge lines would cross the river at least once with temporary adverse effects upon the biota. These impacts will not be significant if conducted as advised by the Idaho Department of Fish and Game, and by the U. S. Army Corps of Engineers.	Consult with Idaho Department of Fish and Game and the U. S. Army Corps of Engineers for specific mitigation methods. These include avoiding discharges in spawning areas during spawning seasons. Avoid discharges in wetlands. Reduce the watercourse to preconstruction bottom contours and remove excess materials to upland disposal site, and others.
Cultural and archeological resources	No cultural resources have been identified at the proposed Eagle treatment site or along the proposed Boise interceptor sludge lines. Excavations have the potential for disturbing previously unknown historical or archeological sites.	Excavations in areas designated by the state archeological officer as potential sources of archeological artifacts should be conducted as advised by professional archeologists. The state archeologist should be kept informed of the progress of the proposed project and the opportunity provided for professional examination of excavated sites and materials.
Description of effluent flow	Disposal of effluent during phases of new construction could be impaired.	Retain existing pipelines, pumping stations, etc., until new facilities are put into operation.
Traffic congestion	Excavation and placement of interceptors and sludge pipeline will temporarily disrupt traffic.	Reroute trucks with oversized loads, and avoid peak traffic periods and major local arterials.

Area of Impact	Description of Impact	Possible Mitigation Measures
Resources and materials	All of the proposed wastewater treatment facilities will require the irretrievable expenditure of energy and materials.	Recover methane gas from anaerobic digestion to aid in operation of waste treatment equipment. Reduce pumping loads, reduce infiltration/inflow in sewer lines, and establish water conservation programs.

Table 2. No-Action Alternatives

Area of Impact	Description of Impact	Possible Mitigation Measures
Construction	None	
Surface water quality	Occasional elevated levels of chlorine, total suspended solids, and ammonia nitrogen (Boise). Present Eagle system is designed for 3 year interim period. Expect violations of NPDES discharge permit conditions.	
Boise River fishery	Potential toxic levels of ammonia and chlorine may be discharged.	Add dechlorination process. Augment river flow.
Resources use	Continue high energy costs of transporting sludge to disposal site by truck (Boise).	Use pipeline transport.
	Continue aerobic digestion of West Boise plant; this will require net 1,830 kilowatt hours per MGD.	Convert to anaerobic digestion; this will require a net of 920 kilowatt hours per MGD.
Archeological resources	None	
Growth implication	Local growth can be reduced or halted.	

Disposal of liquid sludge by pipeline at the state prison farm will be the most energy conserving alternative and will permit the beneficial use of sludge as a fertilizer under controlled disposal and monitoring conditions.

The proposed Eagle wastewater treatment facilities will destroy significant areas of riparian wildlife habitat. The loss of wetlands to treatment ponds, buildings, parking lots, roads, and other construction-related activity is not mitigable.

Loss of habitat to pipelines may be mitigated by revegetation and limiting land use within corridors.

Both the Boise and Eagle proposed wastewater treatment projects will accommodate significant growth in the Boise-Eagle area, and a number of significant growth-related impacts will result.

These impacts, due to increased growth, include further deterioration of air quality in Boise. A decrease in the adequacy of public services, increased drainage problems, loss of valuable agricultural land to urban uses, conflicts with wildlife and fisheries uses through loss of habitat to development and possible disruption or loss of cultural or historic resources due to physical changes of development. These potentially significant impacts may be mitigated through development and implementation of land use plans.

The design for the Boise wastewater treatment facilities assumes a dependable, adequate flow in the Boise River. Thus, it will be essential that a minimum water flow release from Lucky Peak Reservoir be negotiated with the U. S. Water and Power Resources Service.

Chapter 1

INTRODUCTION

The EIS Process

National Environmental Policy Act of 1969 (NEPA) requires that all agencies of the federal government must evaluate the environmental consequences of actions they undertake or sponsor. Consistent with other essential considerations of national policy, agencies are directed to avoid or minimize possible adverse effects of their actions on the quality of the human environment. The major implementation tool of NEPA is the Environmental Impact Statement (EIS). An EIS serves as a decision-making document which describes and analyzes alternative actions or projects. The EIS process serves as a means of obtaining input into agency decisions from other federal agencies, state and local agencies, and the general public.

The EIS process also provides a means for ensuring that project planning considers the requirements of applicable laws and policies. Examples of broadly applicable federal legislation include the Clean Water Act, the Clean Air Act, the Safe Drinking Water Act, the Endangered Species Act, the Fish and Wildlife Coordination Act, and the National Historic Preservation Act. Various Executive Orders and agency policies also must be considered in connection with the protection of floodplains, wetlands, and prime farmland.

Grant Programs Under the Clean Water Act

The federal Clean Water Act establishes a basic goal of achieving "fishable, swimmable" surface waters throughout the country by 1983, and the elimination of pollutant discharges by 1985. The act establishes a permit system (National Pollutant Discharge Elimination System [NPDES]) to regulate the discharge of pollutants to waters of the United States. The various provisions of the Clean Water Act are administered by the U. S, Environmental Protection Agency (EPA). The responsibility for processing NPDES permits is normally transferred to state water quality agencies, with EPA retaining a review and approval role. In Idaho, NPDES permits are processed by the Idaho Department of Health and Welfare.

Section 201 of the Clean Water Act provides a program to help meet the costs of upgrading publicly-owned wastewater treatment systems. These "clean water grants" administered by EPA provide up to 75 percent (or up to 85 percent for innovative treatment/disposal systems) of the planning and construction costs for eligible facility improvements. In order to receive this funding assistance, local wastewater management projects must be planned and designed in accordance with various EPA requirements.

Section 208 of the Clean Water Act provides a separate grant program to fund studies of "areawide" water quality problems.

Background to Development of This EIS

A number of public wastewater treatment systems in Ada County have received EPA grant funds in recent years, including facilities for the City of Meridian and the City of Kuna. Recently, the City of Boise and the Eagle Sewer and Water District also initiated facility planning programs under the Clean Water Grant program. In addition, the Ada Planning Association requested grant funds to evaluate wastewater management alternatives in the rural portions of Ada County. Particular attention was focused on the area southwest of Boise.

EPA decided that a single EIS should be prepared to evaluate proposed wastewater management projects in the Boise area. While the individual projects can be analyzed separately, the significance of project-specific impacts is best determined from an areawide or cumulative perspective. The individual projects under consideration include those of the City of Boise, the Eagle Sewer and Water District, and the Ada Planning Association's Southwest Area study.

Report Format

This EIS is organized into chapters which discuss general topic areas investigated during report preparation. The initial chapters provide information on the wastewater management programs planned for the area. Subsequent chapters discuss major topic areas related to potential impacts. Each such chapter includes discussion of essential background information, relevant project details, impact analyses, and potential mitigation measures. Some of the chapters in this EIS are based on special studies described in more detail by separate study reports or appendix documents.

Several reports have been prepared specifically for this project, and represent a considerable amount of supplemental technical information which may be useful to those reviewing this Draft EIS. These reports include:

- Ground Water Resources of Boise Valley, Idaho, H. Esmaili & Associates, Inc. June 1980.
- Nonpoint Source Waste Loadings in Ada County and Southwest Community Study Area, H. Esmaili & Associates, December 1980.
- Drainage Task Report - Drainage Planning and Institutional Evaluations, Jones & Stokes Associates, Inc. February 1980.
- A Tethersonde Field Study Examining Low Level Stability in the Boise Valley, North American Weather Consultants. April 1980.
- Ozone Data for Ozone Special Study, Boise, Idaho, Earthmetric's Incorporated. November 1979.

These reports are available for review in the EPA Boise office. If a strong need is identified by a reviewer, a copy of the required report will be provided.

In addition, other technical information which has been developed as background for this Draft EIS has been included in a separate appendix. This appendix may be reviewed in the EPA Boise office, or requested from the EPA, Region 10 headquarters in Seattle.

Chapter 2

COORDINATION

Introduction

Section 6.203 of the EPA procedures for implementation of the National Environmental Policy Act (Federal Register, Vol. 44, No. 216, November 6, 1979) requires that all EISs discuss the extent and results of coordination activities conducted prior to publication of EISs. This chapter describes the involvement of government agencies, special interest groups, and the public in general in determining the scope and content of this EIS. It also describes, how, when, and where coordination efforts will continue.

Coordination Efforts to Date

Scoping meetings were held in Boise on March 23, April 24, and May 9, 1979. At that time the contractor met with representatives of EPA, state, and local agencies.

The discussions at these meetings centered on: 1) the issues associated with the proposed Ada County water quality management plan being prepared by the Ada Planning Association (APA) under Section 208, 2) the work plans and schedules of the planning projects to be funded by EPA, and 3) the coordination of the EIS with the environmental review of the funded projects.

The principal issues discussed included the following:

- Water quality standard vs. wastewater treatment and disposal and augmentation of instream flow in the Boise River.
- Evaluation of status of programs and projects concerned with population distribution and density vs. air quality maintenance programs designed to achieve air quality compliance for carbon monoxide.
- Community wastewater facilities plans vs. APA and local community ordinances, policies, and goals to conserve and manage land and water resources.
- Population distribution and density vs. cost-effective wastewater treatment and disposal.
- Population distribution and density vs. the quality of drinking water supplies for communities and individuals.

- The effects of land use plans on the long-term beneficial uses of groundwater resources.

- The effects of land use plans on the long-term beneficial uses of surface waters and riparian lands.

- The requirements to meet air quality and water quality standards vs. implementation schedules for EPA grant-fundable projects.

- Public participation and the adequate presentation of sufficient information to understand the cumulative, secondary effects of funded projects on the renewable natural and socio-economic resources.

- The primary and secondary economic impacts of population distributions not in conformance with the comprehensive plan on land owners and a community ability to provide social and utility services.

On May 13 and 14, 1979, three workshops were held in Boise covering issues associated with air quality, surface water and groundwater.

These workshops were followed by a public meeting in Boise on May 14, 1979. This public meeting was publicized by the mailing by EPA of 150 flyers to interested parties in the study area. In addition, many flyers were posted in post offices and public buildings in Boise and the surrounding area including Eagle. The Idaho Statesman highlighted the scheduled meeting.

The public did not respond to this publicity and only personnel from the various agencies concerned with the proposed project appeared at the meeting.

The EPA issued a Notice of Intent (NOI) to prepare an EIS on June 7, 1979, following a meeting with facilities planning personnel and APA representatives.

Numerous contacts with individuals and agencies have been made by the EIS contractor during frequent trips to Boise in the course of this study. Progress reports have been made on occasion to the APA staff and board.

A representative of the contractor was located in Boise for approximately 6 months in the APA offices as a coordinator with both the EPA and APA representatives.

In addition to the specific meetings and contacts referred to above, several committees in Ada County are actively considering a number of issues which relate to the preparation of the EIS. These committees include:

- Wastewater Management Study Committee (advisory committee)
- Transportation, Citizens Advisory Committee
- Air Quality, Citizens Advisory Committee
- Air Policy Committee
- Technical Advisory Committee for Transportation

There is also a Growth Committee in the comprehensive planning section of APA. However, this group has not yet addressed the issues relating to the Draft EIS.

Continuing Coordination Efforts

This Draft EIS has been forwarded to numerous federal, state, and local agencies, special interest groups, and private citizens. It is an informational document for review and comment on the proposed wastewater projects. The distribution list can be found on page 257. The document has been forwarded to the Boise and Eagle public libraries to enable residents to review potential impacts of the project.

Individuals or groups that wish to comment on the EIS may forward written comments to:

Ms. Norma Young, M/S 443
U. S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

EPA will conduct a public hearing to solicit oral comments on the Draft EIS and the Eagle and Boise wastewater facilities proposed projects on April 30, 1981 at 7:30 p.m. at:

Les Bois Room
Third Floor, Boise City Hall
Boise, Idaho

All oral and written comments received on the Draft EIS will be recorded and responded to in a Final EIS which will be available to interested individuals, groups, and agencies approximately 2 months after the public hearing.

Chapter 3

WATER QUALITY MANAGEMENT IN ADA COUNTY

Locational Setting

Ada County, Idaho is located north of the Snake River in the southwestern part of the state (Figure 3-1). Encompassing 673,000 acres, most of the county is between 2,500 and 3,300 feet elevation. The northeastern portion of the county includes the slopes of the Boise Front, which rises to elevations of about 5,900 feet. The southern part of the county is primarily desert, with urban and agricultural areas concentrated in the northern half of the county. The northern half of the county is drained by the Boise River, which joins the Snake River along the border between Idaho and Oregon.

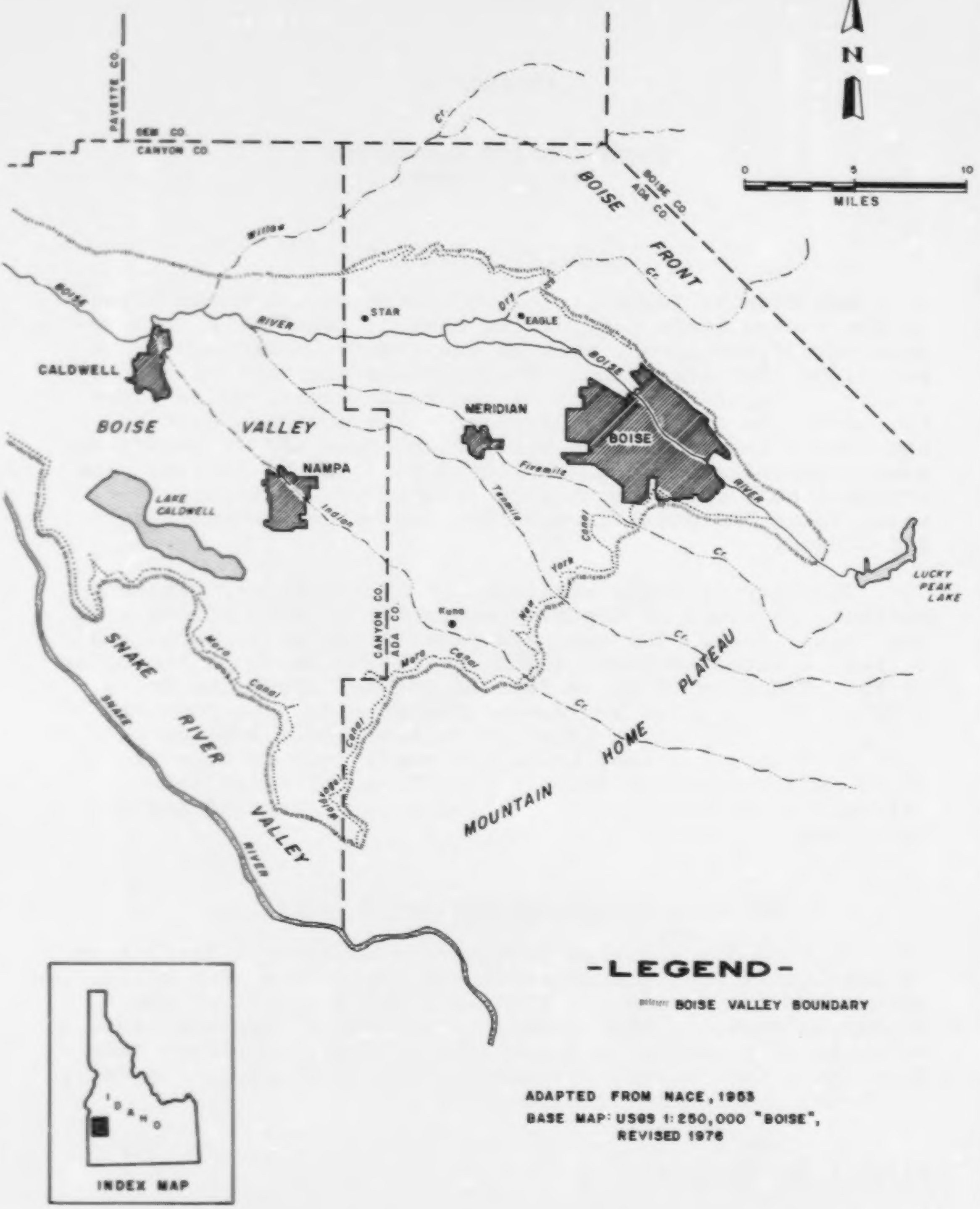
The City of Boise straddles the Boise River, with the northern portions of the city against the lower slopes of the Boise Front. The southern part of the city occupies a series of river terraces (benches) rising south of the Boise River. The City of Eagle is also located along the Boise River, about 9 miles northwest (downstream) from downtown Boise. The City of Meridian is located about 9 miles due west of downtown Boise, while the small Town of Kuna is 13 miles southwest of Boise. The Cities of Nampa and Caldwell in neighboring Canyon County are about 18 and 24 miles west of Boise.

Existing Wastewater Treatment Facilities

Each of the municipal wastewater management facilities in Ada County consists of two basic components -- a collection system and facilities for treatment and disposal of the collected sewage. The wastewater collection systems involve networks of pipelines and pump stations which collect sewage from individual homes, businesses, and industries, and carry it to the wastewater treatment plant.

City of Boise Facilities

The City of Boise is served by three wastewater treatment plants (Figure 3-2). The Gowen Field plant serves the area


N
0
5
10
MILES
PAYETTE CO.
GEM CO.
CANYON CO.
BOISE CO.
ADA CO.
BOISE FRONT
Cr.
Willow
Cr.
Dry
BOISE
RIVER
STAR
EAGLE
BOISE
CALDWELL
MERIDIAN
BOISE
BOISE VALLEY
NAMPA
Firemile
Tenmile
Canal
RIVER
LAKE CALDWELL
Indian
Cr.
York
LUCKY PEAK LAKE
New
Kuna
CANYON CO.
ADA CO.
Cr.
Mora Canal
Mora Canal
Cr.
PLATEAU
SNAKE RIVER VALLEY
SNAKE RIVER
Canal
Ridgeway
MOUNTAIN HOME
-LEGEND-
BOISE VALLEY BOUNDARY
IDAHO
INDEX MAP

ADAPTED FROM NACE, 1953
BASE MAP: USGS 1:250,000 "BOISE",
REVISED 1976

FIGURE 3-1. REGIONAL SETTING

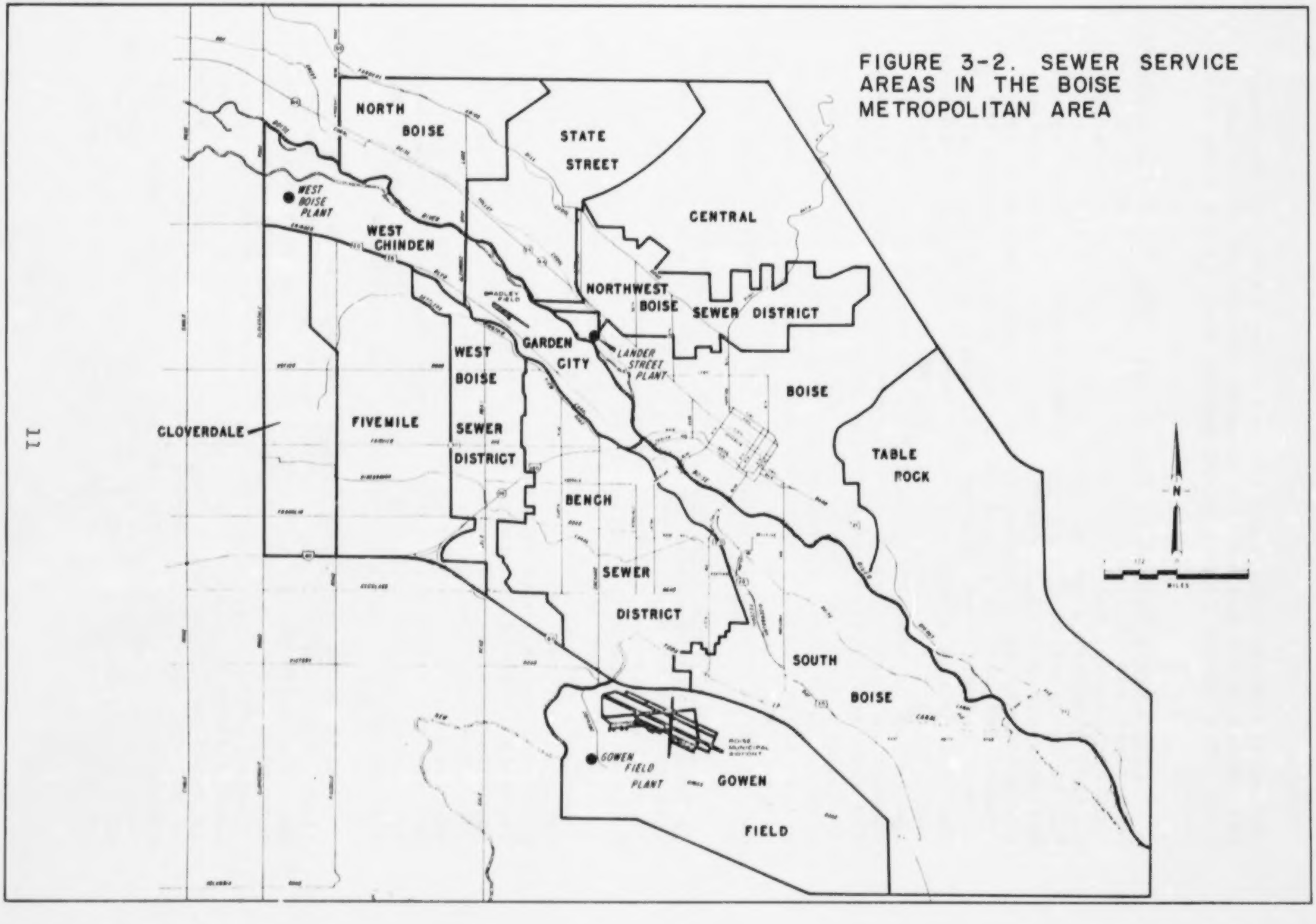


FIGURE 3-2. SEWER SERVICE AREAS IN THE BOISE METROPOLITAN AREA

NORTH BOISE
STATE STREET
CENTRAL
WEST BOISE PLANT
WEST CHINDEN
NORTHWEST BOISE SEWER DISTRICT
BRADLEY FIELD
GARDEN CITY
LANDER STREET PLANT
WEST BOISE SEWER DISTRICT
BOISE
TABLE ROCK
CLOVERDALE
FIVEMILE
BENCH SEWER DISTRICT
SOUTH BOISE
BOISE MUNICIPAL AIRPORT
GOWEN FIELD PLANT
GOWEN FIELD
N
MILES

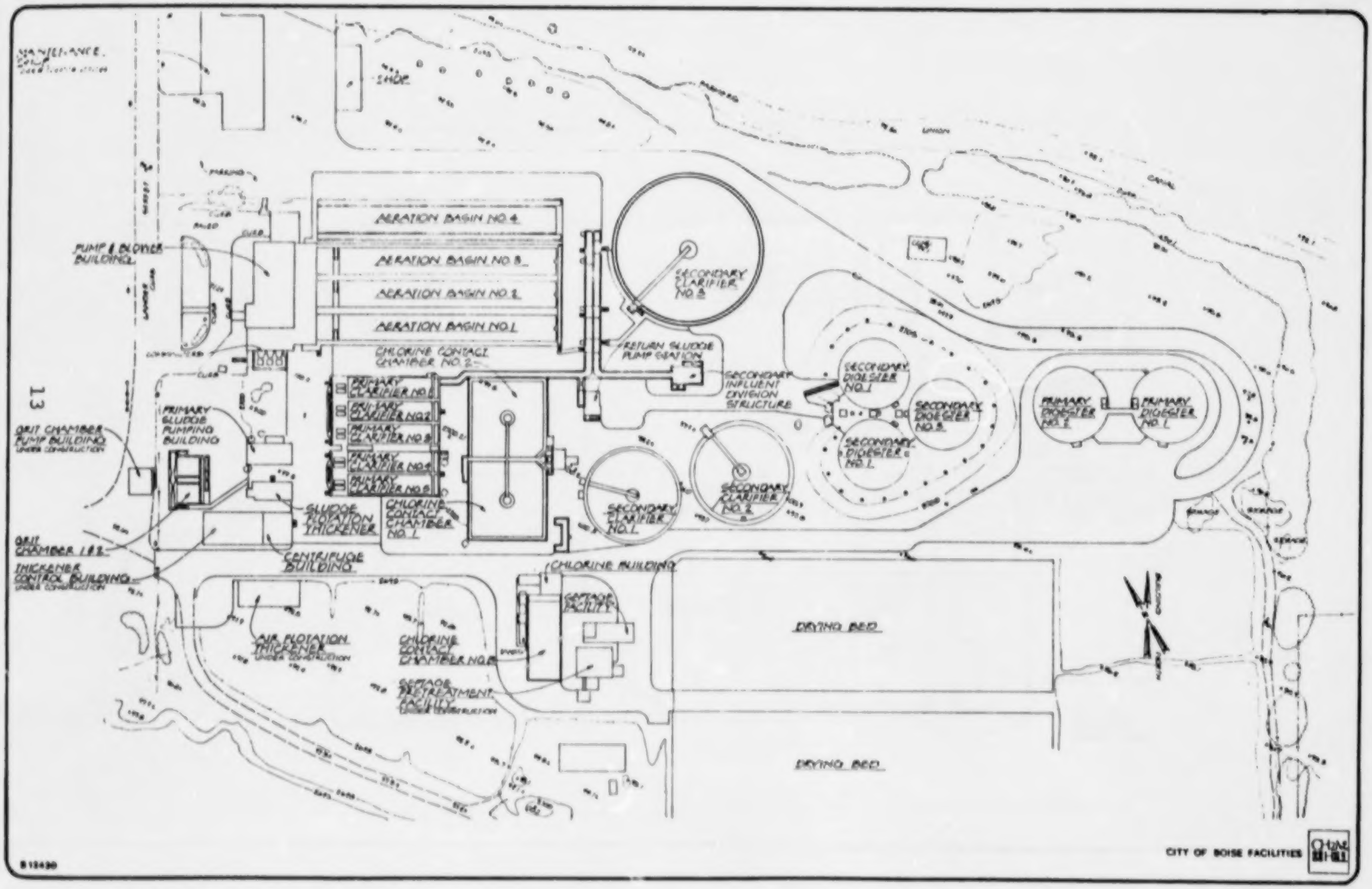
around the Boise municipal airport. The recently completed West Boise plant serves the western portion of the Boise area. The Lander Street plant serves most of the City of Boise.

Gowen Field Treatment Facilities. The Gowen Field treatment plant was built during World War II (1942) by U. S. Army Engineers. The original plant, a high-rate trickling filter, discharged to the upper part of Five Mile Creek. Due to overloading during the summer caused by training of National Guard units, however, the tricking filter system was abandoned and a lagoon system was constructed in 1976. Treated effluent is stored during the winter. During the summer, the effluent is used to irrigate 47 acres of alfalfa The Gowen Field system currently serves the Gowen Field National Guard facilities, the airport, the Boise Industrial Park, the Bureau of Land Management Fire Control Center, and the commercial facilities by the airport and interstate highway. The treatment system has a design capacity of 0.512 MGD (million gallons per day). The storage at the treatment plant is ample to accommodate 0.5 MGD throughout the year, and at these flows, irrigation would have to occur approximately 7 months out of the year. Because effluent is stored during the winter, plant capacity is lower during that period.

Lander Street Treatment Plant. The Lander Street plant is located on the north side of the Boise River in the northwestern part of Boise. Following chlorination, secondary treated wastewater is discharged directly into the Boise River at approximately River Mile 49.7. The plant was built in 1950 as a conventional activated sludge plant with anaerobic digestion. The plant was subsequently modified in 1960-1961, 1968-1969, 1971, 1973, and again in 1975. The existing plant layout is shown in Figure 3-3. The hydraulic design capacity of the facility is 15.0 MGD and 23,000 pounds per day biological oxygen demand (BOD) and total suspended solids (TSS) removal. The Lander Street plant had a peak month discharge of 13.1 MGD in 1978 (CH2M Hill 1979b) and 14.6 MGD in 1979 (CH2M Hill 1980a). These peak month flows occurred during the summer. Sewage flows from the Bench Sewer District also enter the Lander Street Plant for treatment.

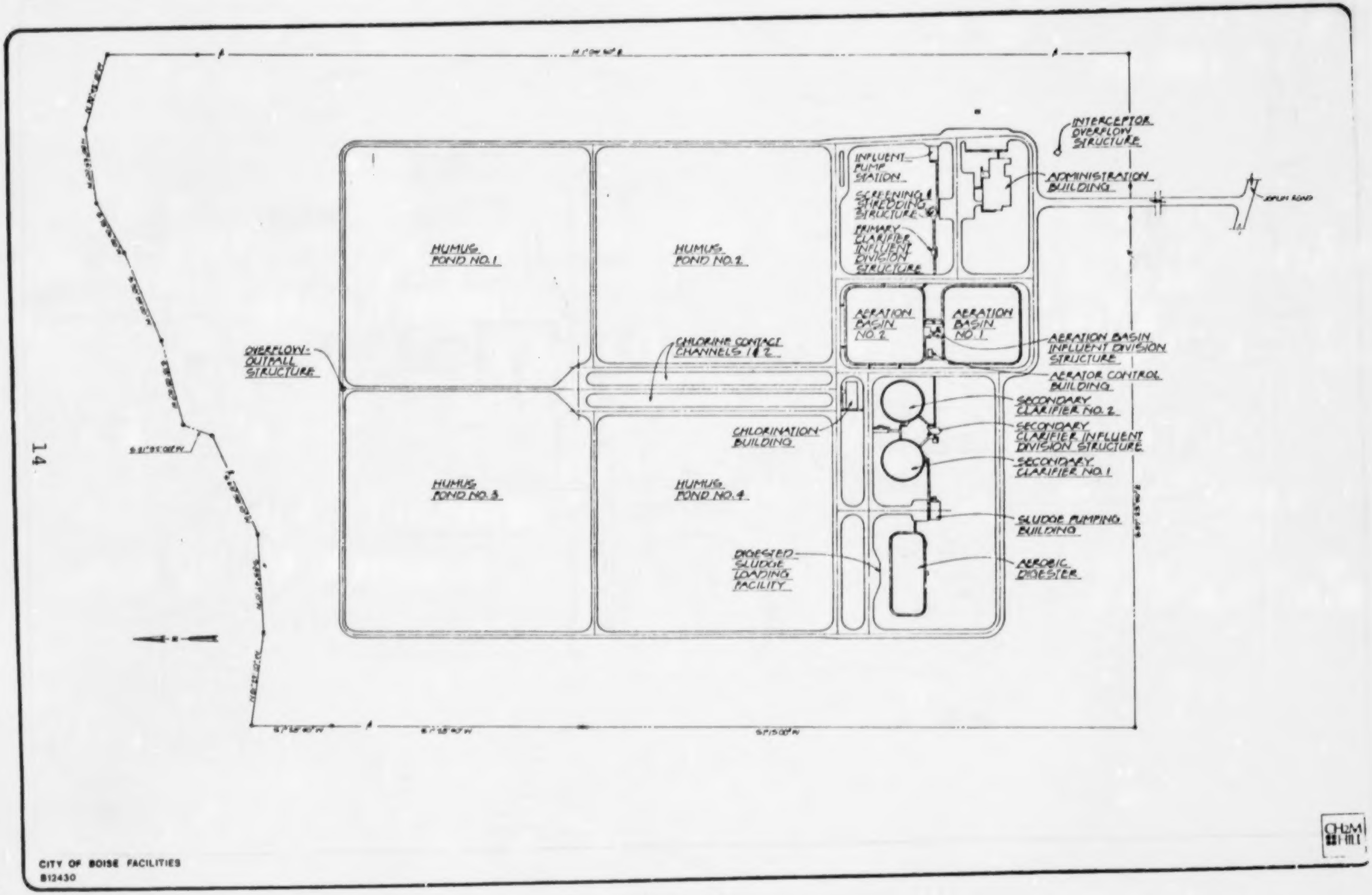
West Boise Treatment Plant. The West Boise treatment plant, built in 1975, is located south of the Boise River near the north end of Cloverdale Road. The West Boise treatment plant uses an activated sludge secondary treatment process. Treated effluent is discharged to the Boise River at approximately River Mile 45. The existing treatment plant layout is shown in Figure 3-4. The treatment facilities are rated at 6.3 MGD hydraulic capacity, 15,000 pounds per day BOD removal, and 15,000 pounds per day TSS removal (peak month flow basis). The West Boise plant had a peak month discharge of 5.28 MGD in 1978 (CH2M Hill 1979b) and 7.4 MGD in 1979 (CH2M Hill 1980a). Peak flows occurred during the summer.

Figure 3-3. Lander Street Treatment Plant Site Plan


MAINTENANCE
SHOP
PUMP & BLOWER BUILDING
AERATION BASIN NO. 4
AERATION BASIN NO. 3
AERATION BASIN NO. 2
AERATION BASIN NO. 1
CHLORINE CONTACT CHAMBER NO. 2
PRIMARY CLARIFIER NO. 1
PRIMARY CLARIFIER NO. 2
PRIMARY CLARIFIER NO. 3
PRIMARY CLARIFIER NO. 4
PRIMARY CLARIFIER NO. 5
SECONDARY CLARIFIER NO. 3
RETURN SLUDGE PUMP STATION
SECONDARY INFLUENT DIVISION STRUCTURE
SECONDARY DIGESTER NO. 1
SECONDARY DIGESTER NO. 3
SECONDARY DIGESTER NO. 2
PRIMARY DIGESTER NO. 2
PRIMARY DIGESTER NO. 1
GRIT CHAMBER PUMP BUILDING
UNDER CONSTRUCTION
PRIMARY SLUDGE PUMPING BUILDING
SLUDGE FLOTATION THICKENER
CHLORINE CONTACT CHAMBER NO. 1
SECONDARY CLARIFIER NO. 1
SECONDARY CLARIFIER NO. 2
GRIT CHAMBER 1 & 2
THICKENER CONTROL BUILDING
UNDER CONSTRUCTION
CENTRIFUGE BUILDING
CHLORINE BUILDING
SEPTAGE FACILITY
DRYING BED
DRYING BED
AIR FLOTATION THICKENER
UNDER CONSTRUCTION
CHLORINE CONTACT CHAMBER NO. 3
SEPTAGE PRETREATMENT FACILITY
UNDER CONSTRUCTION
BUILDING
NORTH
CANAL
CITY OF BOISE FACILITIES
CH2M HILL
B13430

SOURCE: CH2M Hill 1979a.

Figure 3-4. West Boise Treatment Plant Site Plan


INTERCEPTOR OVERFLOW STRUCTURE
INFLUENT PUMP STATION
ADMINISTRATION BUILDING
SCREENING & SHREDDING STRUCTURE
PRIMARY CLARIFIER INFLUENT DIVISION STRUCTURE
HUMUS POND NO. 1
HUMUS POND NO. 2
AERATION BASIN NO. 2
AERATION BASIN NO. 1
AERATION BASIN INFLUENT DIVISION STRUCTURE
OVERFLOW-OUTFALL STRUCTURE
CHLORINE CONTACT CHANNELS 1 & 2
AERATOR CONTROL BUILDING
SECONDARY CLARIFIER NO. 2
CHLORINATION BUILDING
SECONDARY CLARIFIER INFLUENT DIVISION STRUCTURE
SECONDARY CLARIFIER NO. 1
HUMUS POND NO. 3
HUMUS POND NO. 4
SLUDGE PUMPING BUILDING
DIGESTED SLUDGE LOADING FACILITY
AEROBIC DIGESTER
CITY OF BOISE FACILITIES
B12430
CH2M HILL

SOURCE: CH2M Hill 1979a.

Eagle Water and Sewer District

The existing sewage treatment facilities of the Eagle Water and Sewer District (EWSD) were constructed in 1965 and modified in 1975 and 1978. The plant site is located north of the Boise River, west of Eagle Road (Figure 3-5). The existing treatment system consists of two sewage lagoons and two sand filters.

Sewage is pumped into the first pond (1.2 acres) which is aerated by a perforated plastic pipe system. Effluent from the aerated lagoon flows into a second lagoon (1.8 acres) which does not have any special aeration system. The effluent is then pumped to the sand filters (0.41 acre each). After percolating through 2 feet of sand, the effluent is collected by an underdrain system and discharged to the Boise River at river mile 46.25.

The existing facilities have a design capacity of 0.3 MGD for winter and 0.5 MGD for summer. Summer flows have averaged 0.35 MGD (peak summer flows of 0.425 MGD) with an average winter flow of 0.17 MGD (J-U-B Engineers 1980).

Southwest Community Wastewater Management Study

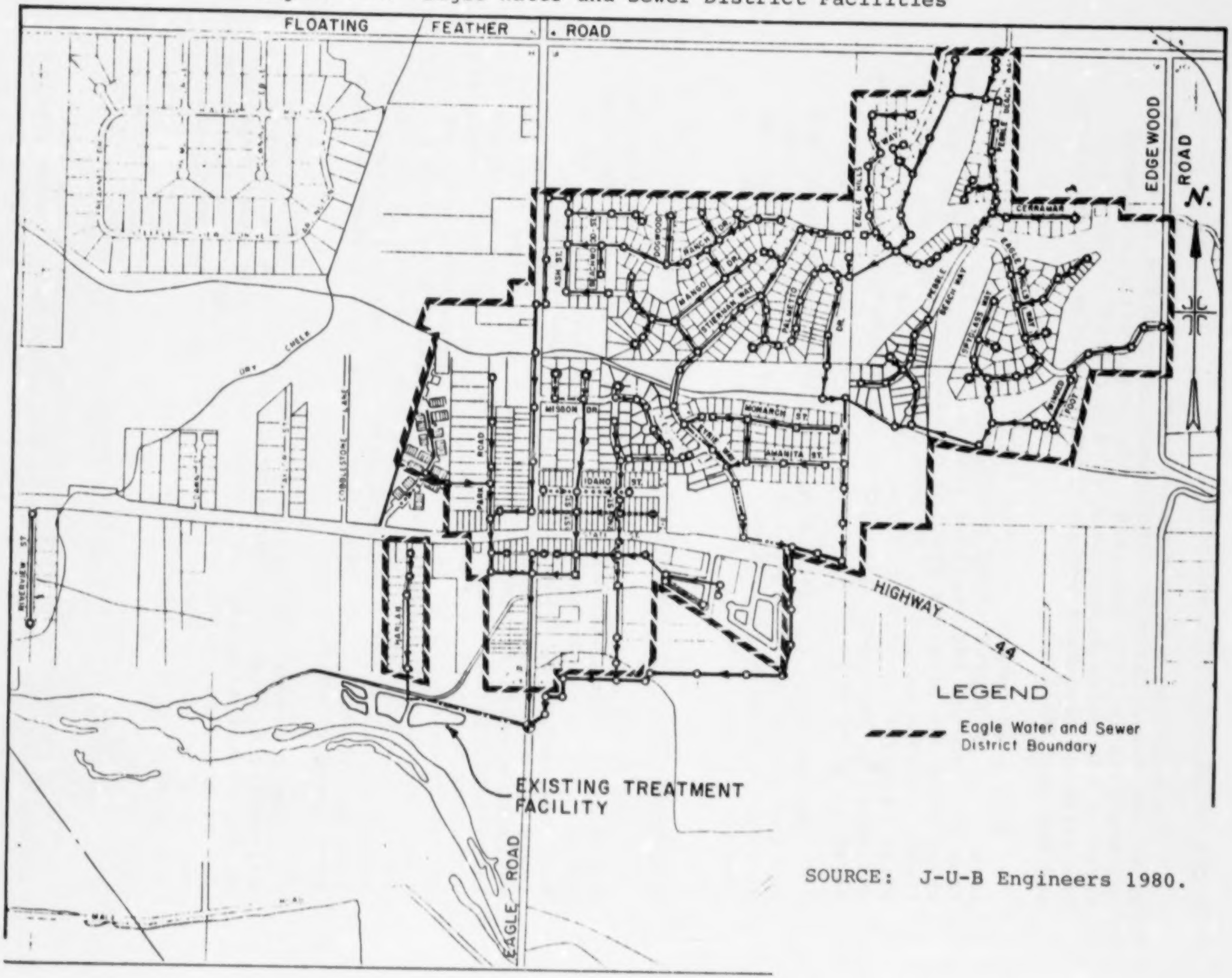
The rural area southwest of Boise (Figure 3-6) contains a mixture of agricultural and large lot residential developments. The area currently has a population of about 14,000. Most residents currently rely on individual septic tanks for wastewater disposal. The Owyhee Sewer District operates a small treatment plant which serves the Indian Lakes subdivision. This facility employs lagoon treatment with land disposal of the effluent. About 920 dischargers are currently connected to this system. The Owyhee plant has a design capacity of 0.35 MGD (Ada Planning Association 1979a). In addition, there is one small package plant (extended aeration and drainfield disposal) serving a truck stop development. One community septic tank system has also been constructed recently.

Concern over the nature of development and associated wastewater disposal practices prompted the APA to initiate an areawide wastewater management study funded under Section 208 of the Clean Water Act. The major objective of the study was to determine whether a centralized sewer and wastewater treatment system was needed for this area.

Facility Problems

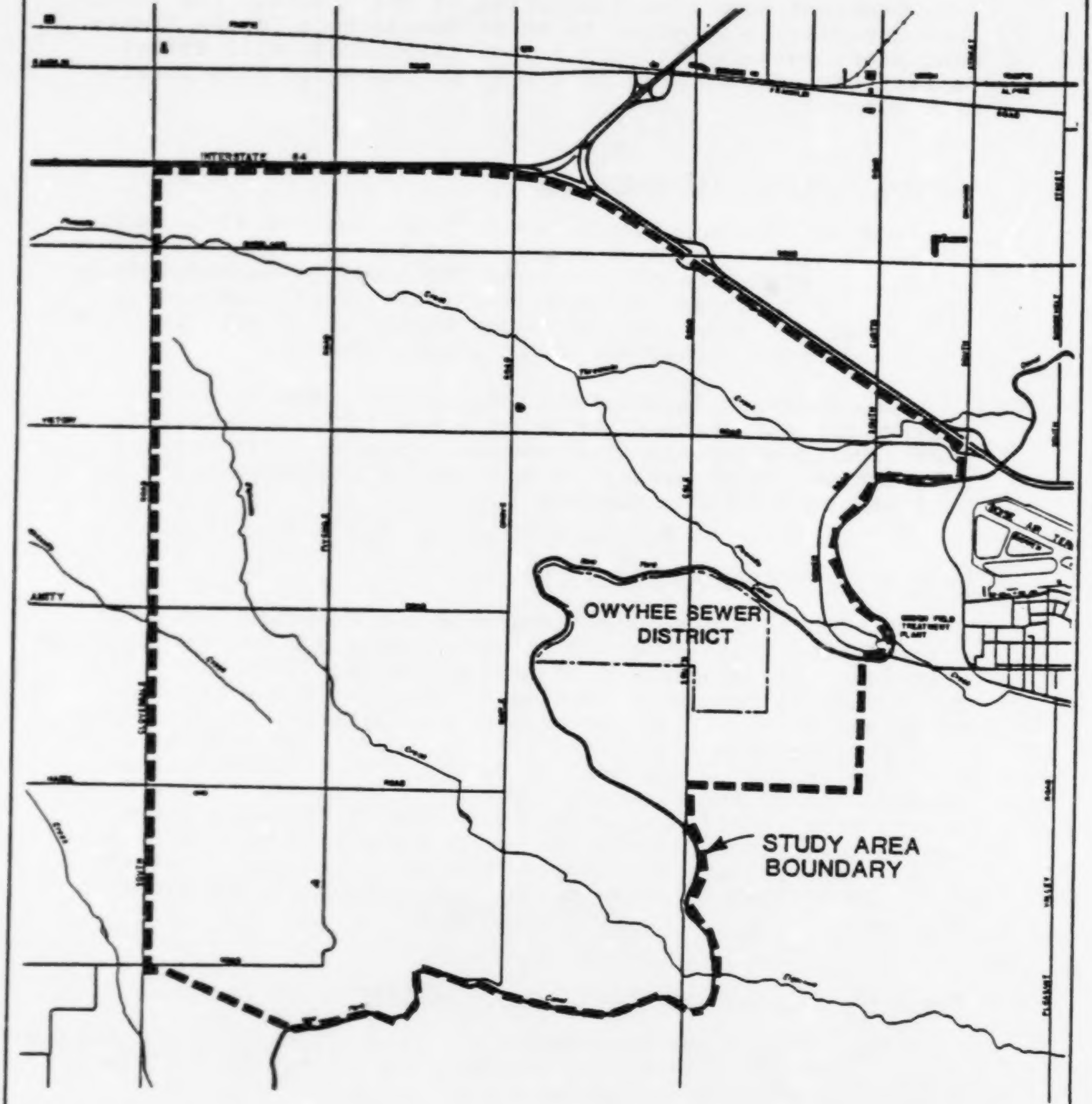
Wastewater management projects and studies have been initiated by the City of Boise, EWSD, and APA. These studies are intended to resolve the problems discussed below.

Figure 3-5. Eagle Water and Sewer District Facilities


FLOATING FEATHER ROAD
EDGEWOOD ROAD
N.
EAGLE ROAD
HIGHWAY 44
EXISTING TREATMENT FACILITY
LEGEND
Eagle Water and Sewer District Boundary
ASH ST.
DOGWOOD
RANCH DR.
MANGO DR.
STIERMAN WAY
PALMETTO DR.
EAGLE HILLS WAY
PEBBLE BEACH WAY
CERRAMAR
MONARCH ST.
AMANITA ST.
MISSION DR.
IDAHO ST.
PARK ROAD
HARLAN
RIVERVIEW ST.
COBBLESTONE LANE
DRY CREEK

SOURCE: J-U-B Engineers 1980.

Figure 3-6. Southwest Community Wastewater Management Study Area


INTERSTATE 84
OWYHEE SEWER DISTRICT
STUDY AREA BOUNDARY

SOURCE: Ada Planning Association 1979a

Gowen Field Treatment Plant

The Gowen Field treatment plant is currently operating at an annual average of 40 percent of capacity. No significant problems have been identified at this plant. The available capacity is expected to serve development in the treatment plant service area until about 1995 (CH2M Hill 1980a). No facility improvements have been proposed for this treatment plant.

Lander Street Treatment Plant

During 1979 peak month sewage flows reached 97 percent of the facility design capacity while BOD loadings reached 94 percent of design capacity and TSS loadings exceeded design capacity by 2 percent (CH2M Hill 1980a). Continued growth in the service area for the Lander Street plant will increase flows and organic loadings above plant capacity.

The existing Lander Street discharge contains an excessive concentration of chlorine (used for disinfection). Excessive concentrations of ammonia are also discharged at some periods of the year. Both chlorine and ammonia can be toxic to aquatic organisms.

West Boise Treatment Plant

During 1979 peak month sewage flows exceeded treatment plant design capacity by 18 percent, while BOD and TSS loadings were less than 40 percent of design capcity (CH2M Hill 1980a). The excessive hydraulic loading at the West Boise plant appears to be due to very high groundwater infiltration in the Garden City sewer system (CH2M Hill 1979a). Continued growth in the area served by the West Boise plant will cause further overloading of the existing capacity. As at the Lander Street plant, treated effluent contains levels of chlorine which may be toxic to aquatic organisms. Industrial wastes received at the West Boise plant have led to some concerns about the combined effects of heavy metals and ammonia in the plant effluent.

Eagle Water and Sewer District Facilities

With the recent construction of sand filters at the existing plant, effluent quality has improved significantly. These sand filters, however, are designed for only a few years of use. Thus future effluent quality problems are expected. Future development in the area served by the existing plant could also create an excessive load on the facilities.

Southwest Community Area

The wastewater management study undertaken by APA was initiated due to concerns about possible groundwater pollution from septic tanks.

Chapter 4

WASTEWATER TREATMENT ALTERNATIVES

Introduction

The wastewater treatment alternatives discussed in this EIS relate to two study areas; the Boise Metropolitan Area (including the unincorporated Southwest 208 study area) and the Eagle Water and Sewer District.

Facilities planning studies recently prepared for the Boise Metropolitan Area by CH2M Hill and for the Eagle Water and Sewer District by J-U-B Engineers, Inc., and a wastewater management study prepared on the Southwest community by Ada Planning Association (APA), were the major references for description of the wastewater treatment alternatives.

City of Boise Facilities

The facilities planning effort for the City of Boise has been focused on a number of aspects: 1) expansion of treatment facilities at the existing Lander Street or West Boise wastewater treatment plants, 2) modification of treatment processes (i.e., nitrification and organics removal), 3) infiltration and inflow studies of Garden City and Boise City, 4) interceptor systems, 5) sewage sludge management, and 6) augmentation of stream flows in the Boise River.

In the preliminary draft facilities plan prepared by CH2M Hill, it was assumed that the unincorporated Southwest community would be served by the West Boise treatment plant; however, during development of the Southwest Community Wastewater Management Study by APA, a decision was made not to provide central sewers to this area. Data from the Boise facilities plan have been adjusted in this EIS to reflect that decision. Additionally, alternatives for the Southwest community are discussed separately herein.

The development of facilities alternatives is typically influenced by two major considerations: required levels of wastewater treatment (discharge requirements) and required facility capacity.

Discharge Requirements

The Idaho Department of Health and Welfare has established water quality standards for the Boise River. These standards (discussed in Chapter 9) are intended to protect a variety of beneficial uses in the Boise River. These water quality standards have in turn been used to set requirements for the level of treatment at the Lander Street and West Boise wastewater treatment plants. These discharge requirements are shown in Table 4-1.

Staging and Capacity Considerations

EPA regulations (U. S. EPA 1978a) provide basic guidance for estimating future wastewater facility needs. Overall planning is based on a 20-year planning period. In many cases, however, actual facility construction will occur in stages during this 20-year period. Facility planning for the City of Boise involved projecting future sewage flows and waste loads for the year 2000. Separate projections were made for different subareas of the Boise area. Population forecasts for these subareas were taken from the forecasts used by the APA (1978a).

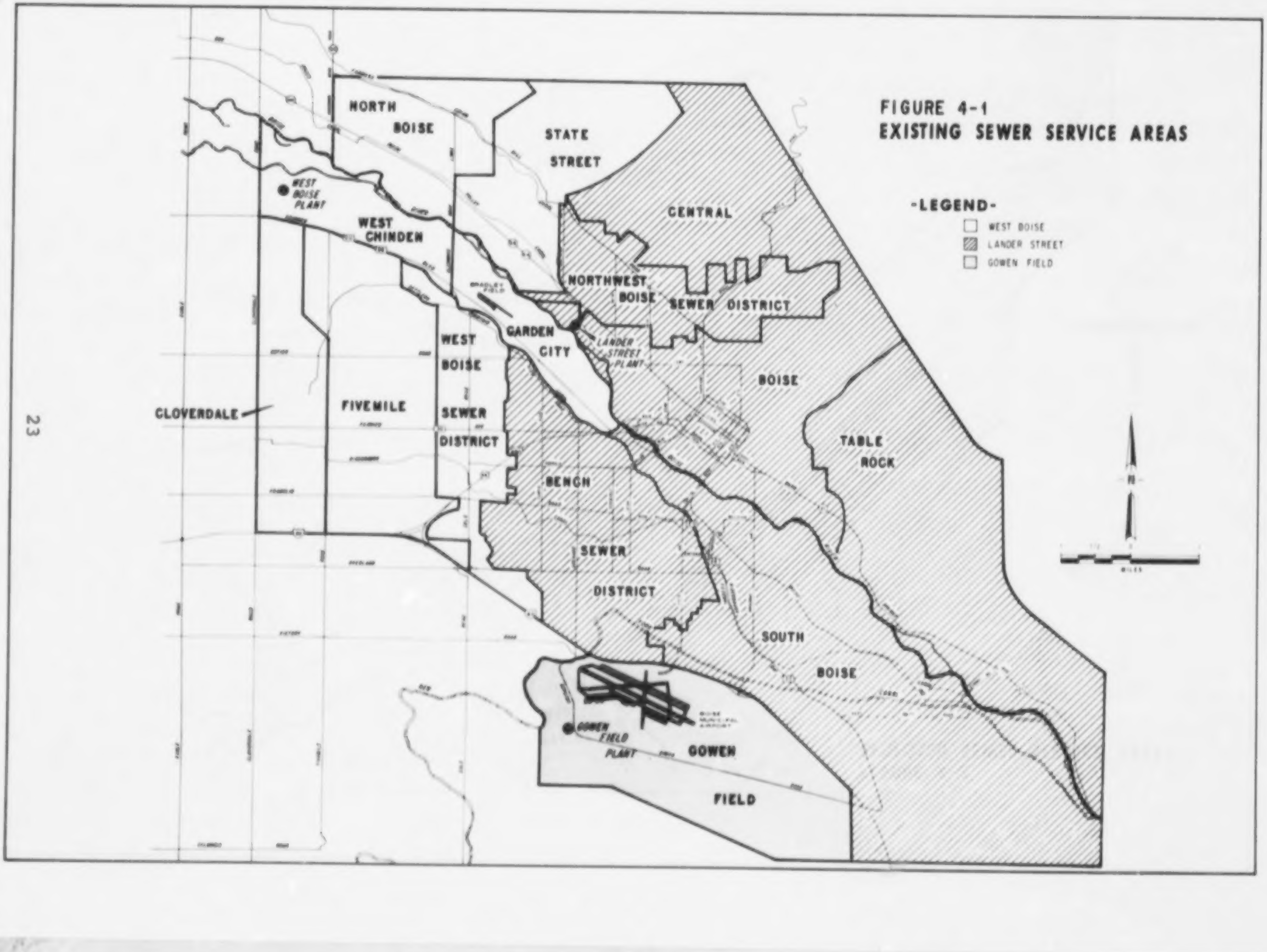
Existing sewage flows and sewage generation rates were determined from water usage data and special studies of sewage flows in major trunk sewers. This is the existing sewer service area shown in Figure 4-1. Separate estimates were made for residential, commercial, industrial and infiltration flow components. Projections for the year 2000 assumed that there would be an increase in per capita or per acre sewage generation rates for most flow components in most subareas. These sewage generation rates (Table 4-2) do not incorporate any water conservation measures, but do reflect programs to control infiltration in the Garden City area.

Existing and projected sewage flows are shown in Table 4-3. The projected residential flows are based on the population projections shown in Table 4-4. These projections assume that all new development will be sewered and that all existing unsewered development will be connected during the next 20 years. While the total population of the Boise area is projected to increase by 68.6 percent between 1978 and 2000, the facility plan anticipates a 120 percent increase in the number of residents actually connected to the treatment plants.

Projected wastewater flows from commercial and industrial development were based on projections of commercial and industrial acreage for the year 2000 (Table 4-5). This is the proposed sewer service area described in Figure 4-2. Existing commercial and industrial acreages were derived from the 1978 zoning plan for the City of Boise (CH2M Hill 1980c). Commercial acreage was projected to increase in direct proportion to population growth while future industrial acreage was estimated from the Boise Metropolitan Planning Area map (CH2M Hill 1980c).

Future infiltration flows were projected using the infiltration rates shown in Table 4-3. In general, increased infiltration rates are projected for all areas. A program

FIGURE 4-1
EXISTING SEWER SERVICE AREAS


-LEGEND-
☐ WEST BOISE
▨ LANDER STREET
☐ GOWEN FIELD
NORTH BOISE
STATE STREET
CENTRAL
WEST BOISE PLANT
WEST CHINDEN
NORTHWEST BOISE SEWER DISTRICT
BRADLEY FIELD
GARDEN CITY
LANDER STREET PLANT
WEST BOISE SEWER DISTRICT
BOISE
CLOVERDALE
FIVEMILE
TABLE ROCK
BENCH SEWER DISTRICT
SOUTH BOISE
BOISE MUNICIPAL AIRPORT
GOWEN FIELD PLANT
GOWEN FIELD
N
MILES

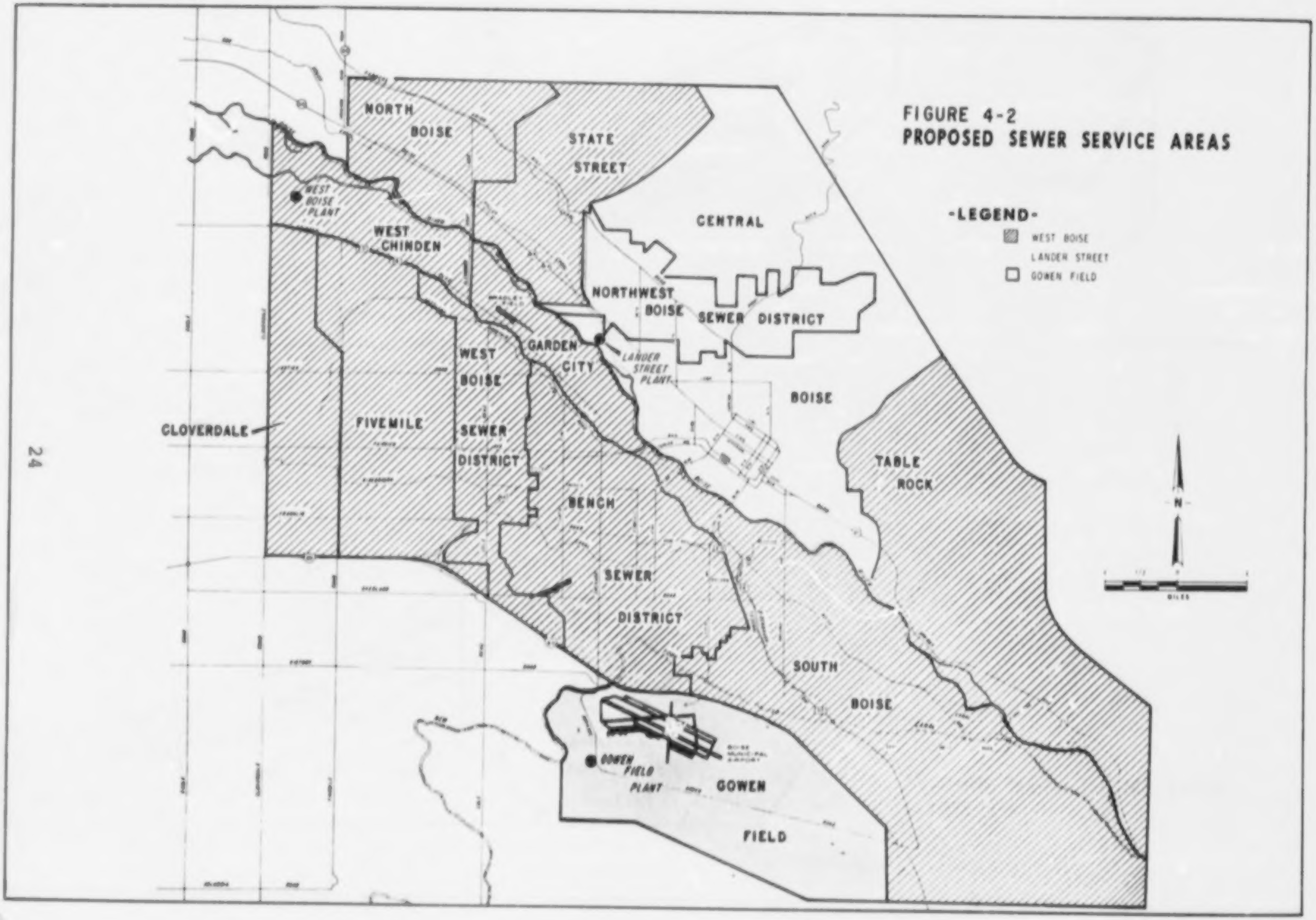


FIGURE 4-2
PROPOSED SEWER SERVICE AREAS

-LEGEND-
▨ WEST BOISE
LANDER STREET
☐ GOWEN FIELD
N
MILES
NORTH BOISE
STATE STREET
CENTRAL
NORTHWEST BOISE SEWER DISTRICT
WEST BOISE PLANT
WEST CHINDEN
GARDEN CITY
LANDER STREET PLANT
BOISE
TABLE ROCK
CLOVERDALE
FIVEMILE
WEST BOISE SEWER DISTRICT
BENCH SEWER DISTRICT
SOUTH BOISE
BOISE MUNICIPAL AIRPORT
GOWEN FIELD PLANT
GOWEN FIELD

Table 4-1. Boise Treatment Plan Effluent Limitations Future and Historical

Parameter	Future Limitation	Historical Limitations			
			West Boise		
	Both Lander St. & West Boise	Lander St.	Boise River Less than 120 cfs[a]	Boise River Less than 170 cfs[a]	Boise River Greater than 170 cfs[a]
BOD	20 mg/l	20 mg/l	20 mg/l	30 mg/l	30 mg/l
TSS	30 mg/l	30 mg/l	30 mg/l	30 mg/l	30 mg/l
Dissolved Oxygen	6 mg/l or 75%	–	90%	90%	80%
Fecal Coliform					
Irrigation (Recreation) Season	50/100 ml	50/100 ml	–	–	200/100 ml
Non-Irrigation Season	100/100 ml	50/100 ml	50/100 ml	100/100 ml	200/100 ml
Chlorine Residual	0.1 mg/l	0.6 mg/l	0.4 mg/l	0.6 mg/l	0.6 mg/l
Ammonia Nitrogen	Varies	18 mg/l	3.4 mg/l	3.4 mg/l	3.4 mg/l

[a] Boise River flow measured at Capitol Boulevard

SOURCE: CH2M Hill 1980c.

Table 4-2. Sewage Generation Rates Used for the Boise Area

	Residential Flows (gpcd)		Commercial Flows (gpad)		Industrial Flows (gpad)		Infiltration/Inflow Rates			
							Average Month (gpad)		Peak Month (gpad)	
Subarea	1979	2000	1979	2000	1979	2000	1979	2000	1979	2000
West Boise Sewer District	62	65	800	800	1,000	1,000	25	150	50	250
Garden City	60	65	715	800	1,000	1,000	1,285	1,625	2,585	2,500
North Boise, State Street, West Chinden, Cloverdale, and Five Mile Sewer Service Areas	60	65	650	800	625	1,000	100	150	200	250
Bench Sewer District	61	65	900	900	1,200	1,200	55	150	165	250
Americana Blvd. Sewer Service Area	54	55	NA	800	NA	NA	55	150	165	250
South Boise Sewer Service Area	64	70	520	800	1,000	1,000	175	200 (150)[1]	250	500 (250)[1]
Table Rock Sewer Service Area	59	65	800	800	1,000	1,000	230	250 (150)[1]	400	1,000 (250)[1]
Central Boise Sewer Service Area	60	65	885	900	1,200	1,200	300	400	500	1,000
Northwest Boise Sewer District	55	60	670	800	NA	NA	100	150	250	500 (250)[1]

NOTES:

See Figure 3-2 for boundaries of sewer districts and sewer service areas.
NA = not applicable
gpcd = gallons per capita per day
gpad = gallons per acre per day
[1] Value in parentheses applied only to new development after 1979.

DATA SOURCE: CH2M Hill 1980.

Table 4-3. Existing and Projected Sewage Flows from Sewer Service Areas in Boise

	Wastewater Flow Component									
	Residential		Commercial		Industrial		Infiltration		Total	
Sewer Service Areas	1978	2000	1978	2000	1978	2000	1978	2000	1978	2000
					Annual Average Flows (MGD)					
North Boise; State Street; West Chinden; Cloverdale; Five Mile; Garden City; West Boise Sewer District	0.93	4.35	0.38	0.80	0.17	3.00	1.95	3.50	3.43	11.65
Bench Sewer District	1.71	2.30	0.47	0.55	0.30	0.30	0.27	0.75	2.75	3.90
Table Rock; South Boise	0.74	3.65	0.11	0.60	0.30	1.50	0.55	2.35	1.70	8.10
Central Boise; Northwest Boise Sewer District	2.38	3.65	1.00	1.15	0.56	0.60	2.13	3.25	6.07	8.65
TOTAL	5.76	13.95	1.96	3.10	1.33	5.40	4.90	9.85	13.95	32.30
					Peak Month Flows (MGD)					
North Boise; State Street; West Chinden; Cloverdale; Five Mile; Garden City; West Boise Sewer District	0.93	4.35	0.38	0.80	0.17	3.00	3.90	5.60	5.38	13.75
Bench Sewer District	1.71	2.30	0.54	0.55	0.30	0.30	0.81	1.25	3.36	4.40
Table Rock; South Boise	0.74	3.65	0.11	0.60	0.30	1.50	0.90	5.05	2.05	10.80
Central Boise; Northwest Boise Sewer District	2.38	3.65	1.02	1.15	0.58	0.60	3.62	7.60	7.60	13.00
TOTAL	5.76	13.95	2.05	3.10	1.35	5.40	9.23	19.50	18.39	41.95

NOTES:

MGD = million gallons per day
See Figure 3-2 for boundaries of sewer districts and sewer service areas.

DATA SOURCE: CH2M Hill 1980.

Table 4-4. Population Projections for Sewer Service Areas Served by the Lander Street and West Boise Treatment Plants

Sewer Service Area	1978		1985		1990		1995		2000	
	Total	Sewered	Total	Sewered	Total	Sewered	Total	Sewered	Total	Sewered
North Boise; State Street; West Chinden; Cloverdale; Five Mile; Garden City; West Boise Sewer District	35,010	15,250	46,090	30,580	54,145	40,205	61,950	53,625	66,790	66,790
Bench Sewer District	31,410	28,700	33,060	31,125	33,270	31,980	34,110	33,465	35,805	35,805
Table Rock, South Boise	17,000	12,000	27,580	24,020	38,275	35,870	47,700	46,490	53,840	53,840
Central Boise; Northwest Boise Sewer District	42,390	40,500	46,420	45,035	49,285	48,300	52,560	52,040	55,710	55,710
TOTAL	125,810	96,450	153,150	130,760	174,975	156,355	196,320	185,620	212,145	212,145

See Figure 3-2 for boundaries of sewer service areas.

DATA SOURCE: CH2M Hill 1980.

Table 4-5. Projected Commercial and Industrial Acreage in the Boise Area

Sewer Service Area	Commercial Area (acres)		Industrial Area (acres)	
	1978	2000	1978	2000
North Boise; State Street; West Chinden; Cloverdale; Five Mile; Garden City; West Boise Sewer District	565	800	215	1,360
Bench Sewer District	520	600	250	250
Table Rock, South Boise	190	750	265	1,430
Central Boise; Northwest Boise Sewer District	930	1,250	330	370
TOTAL	2,205	3,400	1,060	3,410

See Figure 3-2 for boundaries of sewer service area.

DATA SOURCE: CH2M Hill 1980.

to eliminate 1.0 MGD of infiltration from the Garden City area is assumed in the infiltration rates shown in Table 4-3.

Projected waste loads (biochemical oxygen demand and total suspended solids) are shown in Table 4-6.

The no-action alternative includes a continuation of treatment and discharge at the Lander Street and West Boise treatment plants. The Lander Street plant discharges secondary treated wastewater directly to the Boise River. This plant had a peak month discharge of 13.1 MGD in 1978 and 14.6 MGD in 1979 during the summer. The hydraulic design capacity of the facility is 15.0 MGD. The plant is operating at capacity, both hydraulically and organically.

The West Boise treatment plant also discharges to the Boise River with a peak flow of 5.28 MGD in 1978 and 7.4 MGD in 1979 during the summer. The treatment facilities are rated at 6.3 MGD hydraulic capacity. The plant is operating at hydraulic capacity, but is far below organic capacity.

Development of Project Alternatives

A series of technical memoranda has led to the development and screening of treatment alternatives. This alternative development program for wastewater treatment facilities was based on several key factors:

- The Gowen Field treatment plant will remain as is, and continue to serve only the present service area.
- There is limited space available at the Lander Street plant; the actual expansion limitations are governed by the level of treatment required.
- The existing West Boise plant was designed with expansion in mind and a parallel treatment plant could be constructed at the existing plant site to handle higher flows.
- There are certain effluent limitations governed by seasonal flows in the Boise River.

Treatment Plant Expansion and Modification. Treatment plant expansion was considered at the Lander Street and West Boise treatment facilities. A cost-effective analysis and evaluation of site constraints by CH2M Hill showed that the Lander Street facility would be best suited to remain at its present capacity with minor modifications necessary to meet effluent discharge requirements. These modifications include:

- Dechlorination to remove excess chlorine prior to discharge. This would be accomplished by use of a sulfur-dioxide and postaeration process.

Table 4-6. Projected Waste Loads from Sewer Service Areas in Boise

Sewer Service Area	BOD Loads (pounds per day)				TSS Loads (pounds per day)			
	Annual Average		Peak Month		Annual Average		Peak Month	
	1978	2000	1978	2000	1978	2000	1978	2000
North Boise; State Street; West Chinden; Cloverdale; Five Mile; Garden City; West Boise Sewer District	2,600	12,025	3,325	15,395	2,610	12,025	3,785	17,435
Bench Sewer District	4,880	6,445	6,245	8,250	4,880	6,445	7,075	9,345
Table Rock, South Boise	2,140	9,800	2,740	12,545	2,080	9,745	3,015	14,120
Central Boise; Northwest Boise Sewer District	9,880	13,775	12,655	17,635	9,140	12,965	13,255	18,800
TOTAL	19,500	42,045	24,965	53,825	18,710	41,180	27,130	59,700

Notes: BOD = biochemical oxygen demand
TSS = total suspended solids

DATA SOURCE: CH2M Hill 1980.

- Changes for more efficient use of methane gas. The cost-effective evaluation indicated that several project components could operate on methane gas.

Expansion of major facilities was judged by CH2M Hill to be best accommodated at the West Boise treatment plant. That expansion would be accomplished in a two-stage approach; the first expansion stage coming probably in 1983 and the second in 1987 or 1988.

- Stage 1 - The Stage 1 expansions would include the addition of approximately 10.7 MGD of capacity to the West Boise facilities, bringing the peak hydraulic capacity to 17 MGD. These additions would include a new influent pump, primary and secondary clarifiers, sludge pumps, and anaerobic primary and secondary sludge digesters. A number of other minor additions would also be made.

  One major modification at the West Boise facility would involve sludge digestion. Present sludge digestion processes differ at the Lander Street and West Boise treatment plants; existing digestion at the Lander Street facility is anaerobic while at the West Boise plant sludge is digested aerobically. The CH2M Hill facilities plan analyzed three alternatives at the West Boise facility: continued aerobic digestion; continued aerobic digestion with modifications to simplify future conversion to anaerobic digestion; and conversion to anaerobic digestion. The comparative costs of those three alternatives is shown in Table 4-7.

- Stage 2 - The second stage of expansion would include construction of an equal capacity (17 MGD) treatment plant adjacent to the present and Stage 1 expansion facilities. That expansion should have sufficient capacity to serve the City of Boise's wastewater needs past the year 2000, particularly since the Southwest community would not be contributing wastewater to the system.

The previously mentioned Stage 1 and Stage 2 modifications and expansion of the West Boise treatment plant facilities are the preferred alternatives represented in the Boise facility plan.

Sludge Management. A wide variety of the sludge processing, transport, storage, and disposal alternatives were presented by CH2M Hill in the Sludge Management Technical Memorandum and in Chapter VI of the Wastewater Facilities Plan (Part 1) (October 1980). Land application sites were evaluated on Eagle Island and at the Idaho State Prison Farm.

Table 4-7. Cost Analysis - West Boise Sludge Treatment

	Present Worth Costs[a]			
Alternative	Capital	Operation and Maintenance	Salvage Value	Total
No. 1 - Aerobic Digestion	$17,100,000	$8,045,000	$1,635,000	$23,510,000
No. 2 - Aerobic Digestion With Primary Clarification and Flotation Thickening (to allow future anaerobic digestion)	$16,830,000	$8,685,000	$1,760,000	$23,755,000
No. 3 - Anaerobic Digestion	$19,915,000	$7,885,000	$2,000,000	$25,800,000

[a] All present worth costs are converted to December 1980 dollars (assumed ENR CCI = 3,414) based on a 20-year amortization period and a 7-1/8 percent discount rate.

SOURCE: CH2M Hill 1980c.

Five basic sludge management alternatives were defined in the preliminary screening, each with a large number of suboptions for dewatering, transport, storage and disposal. Those alternatives were further screened to four alternatives (Chapter VIII of Wastewater Facilities Plan, Part II) and eventually to three composite alternatives:

- Digested (liquid) sludge truck transport to agricultural use/disposal.
- Digested (liquid) sludge pipeline transport to agricultural use/disposal.
- Digested sludge (dewatered form) with truck transport and landfill disposal.

Costs of these three alternatives are presented in Table 4-8.

The preferred disposal site for sludge was the prison farm because of the availability of an isolated and contiguous site, the environmental constraints, presence of an existing farming operation and the proximity to the Boise treatment plants. Approximately 1,700 acres would be needed for sludge application.

The majority of digested sludge in the Boise planning area originates from the Lander Street treatment plant and is transported by liquid transfer trucks to the agricultural use sites located near Eagle and in the Idaho State Prison area. Historically the Eagle area has served as the primary agricultural use site.

Truck routes from Lander Street and West Boise treatment plants would be the same as for existing sludge disposal routes. A number of pipeline alternatives were defined (see _Boise Wastewater Facilities Plan Summary_, September 1980). (see Figure 4-3).

A detailed analysis of agricultural use and disposal was presented in Chapter VII, page 61 of the wastewater facilities plan (Part II), October 1980. Within that chapter are discussions of guidelines and regulations for land application of sludge, soil suitability, sludge application limits, land requirements, methods of sludge application, and program management.

A combined pipeline/truck sludge transportation system offers some major advantages over separate systems. Proposed pipeline routes would extend from the West Boise and Lander Street treatment plants to the Gowen Field treatment plant site. Trucks would then be used to transport the liquid sludge 6 miles from Gowen Field to the prison area.

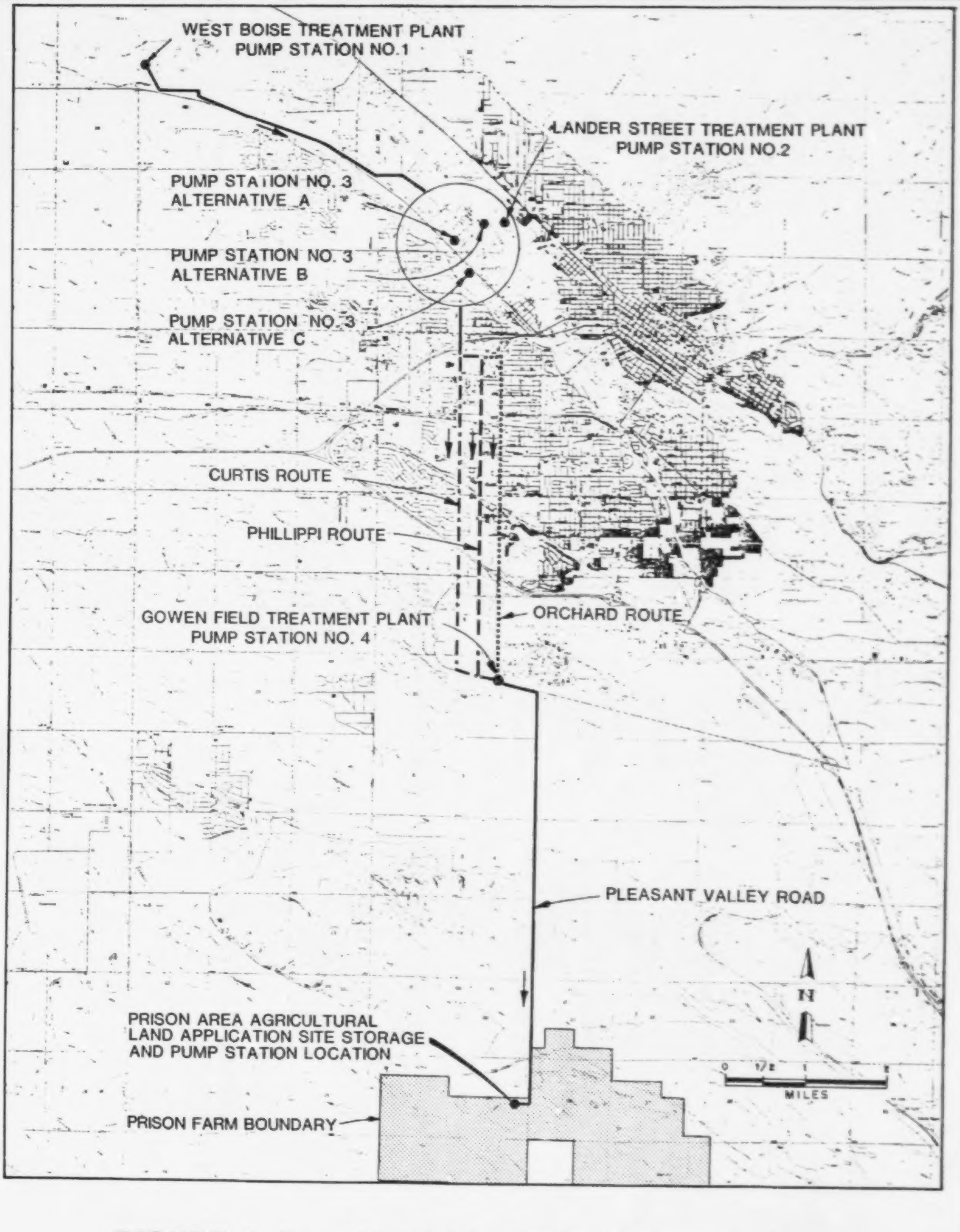

WEST BOISE TREATMENT PLANT
PUMP STATION NO.1
LANDER STREET TREATMENT PLANT
PUMP STATION NO.2
PUMP STATION NO. 3
ALTERNATIVE A
PUMP STATION NO. 3
ALTERNATIVE B
PUMP STATION NO. 3
ALTERNATIVE C
CURTIS ROUTE
PHILLIPPI ROUTE
GOWEN FIELD TREATMENT PLANT
PUMP STATION NO. 4
ORCHARD ROUTE
PLEASANT VALLEY ROAD
N
0
1/2
1
2
MILES
PRISON AREA AGRICULTURAL
LAND APPLICATION SITE STORAGE
AND PUMP STATION LOCATION
PRISON FARM BOUNDARY

FIGURE 4-3. SLUDGE PIPELINE ROUTING & LAND APPLICATION SITE

Table 4-8. Sludge Management Alternatives

	Present Worth Estimate[a]			
Alternative	Capital	Operation and Maintenance	Salvage Value	Total
Sludge Truck Transport/ Agricultural Disposal	$1,228,000	$3,148,000	$207,000	$4,169,000
Sludge Pipeline Transport/ Agricultural Disposal	4,047,000	899,000	447,000	4,499,000
Dewatered Sludge/Truck Transport/Landfill Disposal	3,567,000	3,350,000	478,000	6,439,000

[a] All present worth estimates are converted to December 1980 dollars based on a 20-year amortization period and a 7-1/8 percent discount rate.

SOURCE: CH2M Hill 1980c.

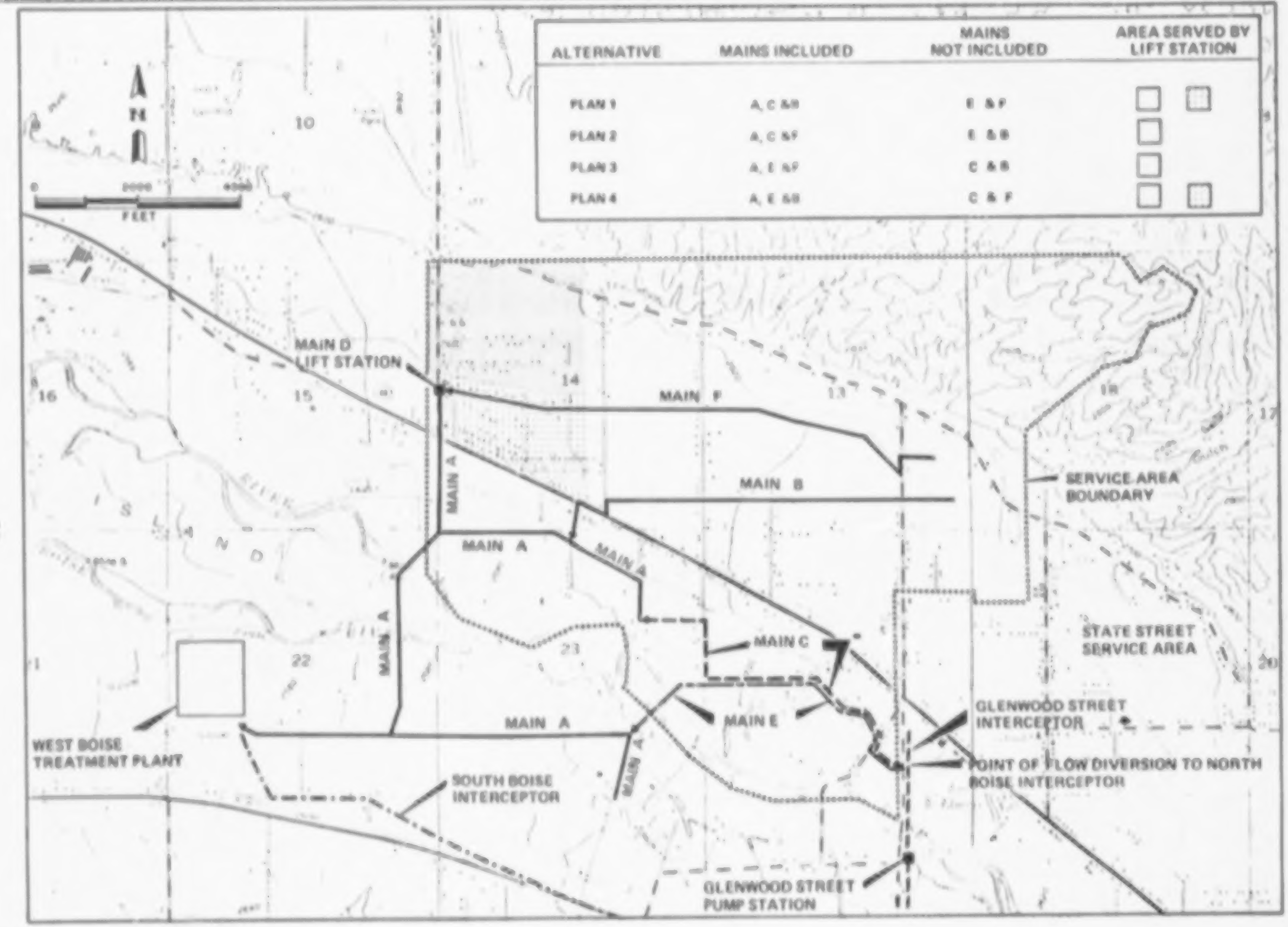
Interceptor System. Two technical memoranda were prepared by CH2M Hill which dealt with interceptor needs in the Boise area. The two studies include *Location Study - North Boise Interceptor Technical Memorandum* and the *South Boise Interceptor Route Selection Technical Memorandum*. The studies focused on three distinct needs: wastewater collection needs in northwest Boise, routing analysis of the South Boise interceptor through Garden City, and an analysis of need for sewer rehabilitation in Garden City and Boise.

North Boise Interceptor. Four alternative interceptor alignment plans were identified in the *North Boise Interceptor Technical Memorandum* to serve North Boise, an area now served by septic tank-drainfield systems and projected as an area for rapid development (see Figure 4-4). Conclusions of that memo were:

- The North Boise service area would total 5,800-6,000 acres and up to 24,300 connections, depending on the alignment plans selected.
- The North Boise interceptor should be sized to handle excess flows of 5.6 MGD from the existing Glenwood pump station.
- Extensive rights-of-way would be required under all alignment plans.
- The location of the floodway boundary of the Boise River affects the choice of an interceptor plan and the area likely to be serviced by the sewer.
- Estimated capital costs appear in Table 4-9.
- Operation and maintenance costs are comparable among alternatives.
- Plan 4 offers the maximum flexibility for staged construction.

South Boise Interceptor. The existing South Boise interceptor carries wastewater flows from the Garden City area to the West Boise treatment plant. The proposal is to extend the interceptor Southwest to relieve existing trunk and interceptor lines flowing near capacity. A detailed analysis of the routes and the advantages and disadvantages of each was presented in the *South Boise Interceptor Technical Memorandum* prepared by CH2M Hill.

The existing interceptor now terminates at the intersection of Field and Bradley Streets. The four alternative routings were evaluated between the terminus at Field Street and Main Street, approximately 11,000 feet to the southeast. Portions of two of those alignments, River North and River West, would be located within or fringing on the floodway of the Boise River. In addition, the South Boise interceptor east of Americana Boulevard would cross the Boise River to join the future Table Rock interceptor. Two alternative routes were evaluated from Main Street to Americana Boulevard, a distance of approximately 4,000 feet (see Figure 4-5).



N
0
2000
4000
FEET
10
16
15
14
13
18
17
20
22
23
1
ISLAND
MAIN D
LIFT STATION
MAIN F
MAIN B
MAIN A
MAIN C
MAIN E
SERVICE AREA
BOUNDARY
STATE STREET
SERVICE AREA
GLENWOOD STREET
INTERCEPTOR
POINT OF FLOW DIVERSION TO NORTH
BOISE INTERCEPTOR
GLENWOOD STREET
PUMP STATION
WEST BOISE
TREATMENT PLANT
SOUTH BOISE
INTERCEPTOR

ALTERNATIVE	MAINS INCLUDED	MAINS NOT INCLUDED	AREA SERVED BY LIFT STATION
PLAN 1	A, C &B	E &F	☐ ▦
PLAN 2	A, C &F	E &B	☐
PLAN 3	A, E &F	C &B	☐
PLAN 4	A, E &B	C & F	☐ ▦

FIGURE 4-4. NORTH BOISE INTERCEPTOR ALTERNATIVES

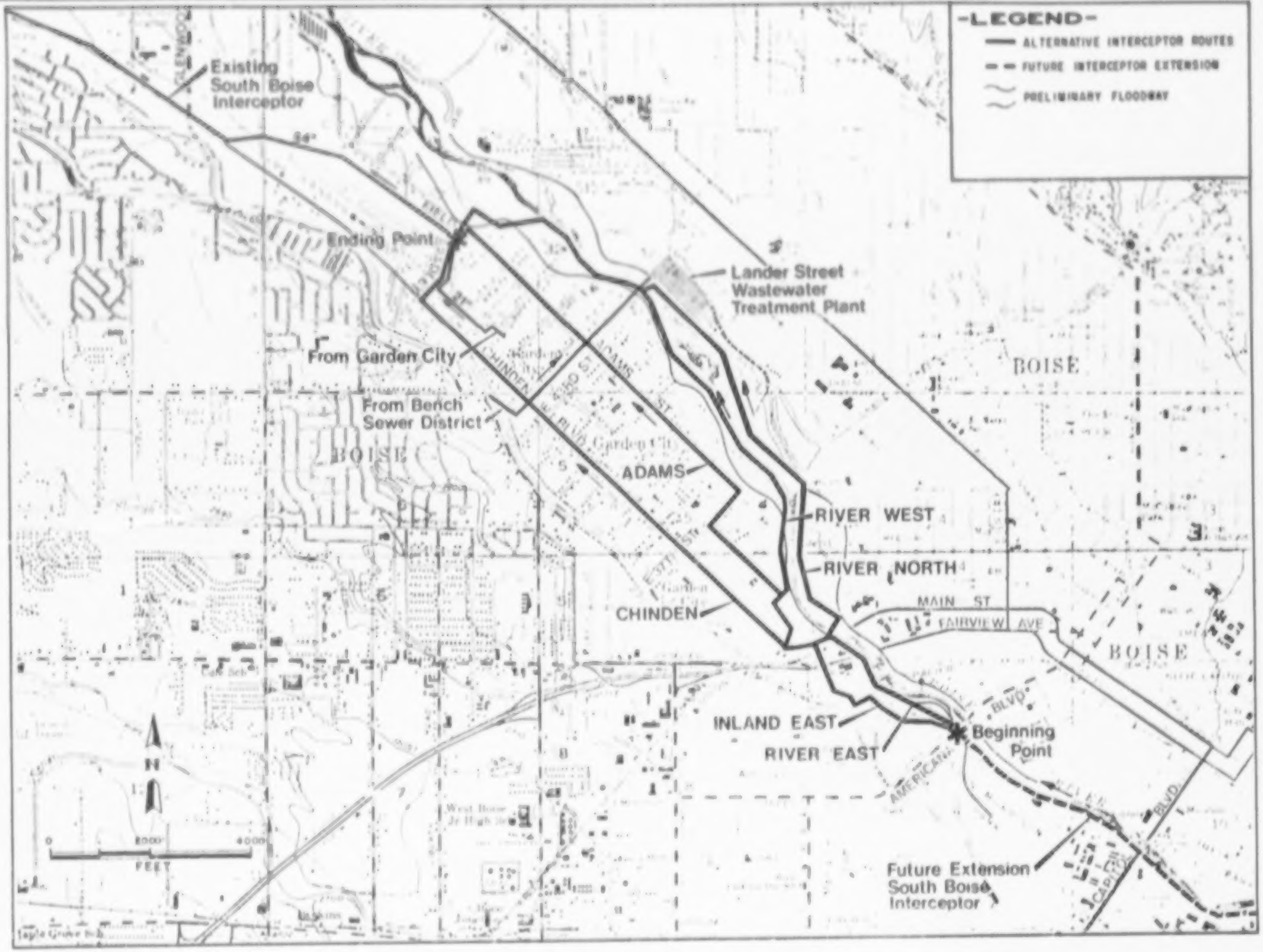

-LEGEND-
ALTERNATIVE INTERCEPTOR ROUTES
FUTURE INTERCEPTOR EXTENSION
PRELIMINARY FLOODWAY
Existing South Boise Interceptor
Ending Point
Lander Street Wastewater Treatment Plant
From Garden City
From Bench Sewer District
CHINDEN
ADAMS ST
ADAMS
RIVER WEST
RIVER NORTH
CHINDEN
MAIN ST
FAIRVIEW AVE
BOISE
BOISE
BOISE
INLAND EAST
RIVER EAST
Beginning Point
AMERICANA BLVD
CAPITOL BLVD
Future Extension South Boise Interceptor
N
0
2000'
4000'
FEET

FIGURE 4-5. ALTERNATIVE SOUTH BOISE INTERCEPTOR ROUTES

Table 4-9. Capital Costs of Alternative Plans - North Boise Interceptor

Plan	Capital Costs	Capital Cost/Acre Served
1	$3,465,000	$599
2	$3,372,000	$583
3	$3,450,000	$574
4	$3,509,000	$584

SOURCE: CH2M Hill 1980c.

Expansion of the South Boise interceptor would likely be accomplished in two stages: Stage 1 - connection of the Bench Sewer District to the interceptor and; Stage 2 - connection to and east of Americana Boulevard.

No preferred alignments have yet been chosen by the facilities engineers pending public comment and review.

Infiltration. Studies of infiltration/inflow in Garden City and Boise indicated that rehabilitation of the sewer system would prove cost-effective in Garden City but not in Boise. Of the total identifiable infiltration of 3.45 MGD, as much as 1.04 MGD could be economically removed.

Flow Augmentation. Under present conditions, flows in the Boise River during the summer months (irrigation season) are sufficient to provide proper dilution of effluent from the Lander Street and West Boise treatment facilities. Winter flows (nonirrigation season), however, are significantly less than summer flows. A program of releasing greater flows downstream from Lucky Peak Reservoir is being developed by the Idaho Department of Fish and Game, the Idaho Departments of Water Resources and Health and Welfare.

The Idaho Department of Fish and Game has established stream resource maintenance flows (SRMF) of 225 cfs in October and November and 150 cfs during January through March. A 1-year-in-10 low river flow of 80 cfs was used by the Idaho Department of Health and Welfare to determine treatment plant effluent limitations at the West Boise and Lander Street plants. Table 4-10 shows the percent of time that the Lander Street and West Boise plants would have ammonia limitations.

Energy Requirements

Treatment Plant Expansion and Modification. In the Boise facilities plan, CH2M Hill explored six options and several suboptions for the utilization of methane (digester) gas at the Lander Street treatment plant. Primary use of the gas would be to operate raw sewage pumps and air blowers; however, two options for generating electricity for sell-back to the Idaho Power Company (IPCo) were also evaluated. Digester gas generation would vary from approximately 90,000 cubic feet per day during the winter to 140,000 cubic feet per day during the summer. The quantity of natural gas or electrical power needed to supplement the use of digester gas at the facilities would vary with the option. The total average energy cost would depend on: (1) the equipment needed, (2) whether natural gas or electricity was used to supplement digester gas and the future projected cost of each, and (3) the credit price allowed for electrical energy generated and fed back to IPCo. CH2M Hill recommended that the City of Boise choose the preferred option after negotiations for sale of generated electricity to IPCo are finalized.

Table 4-10. Ammonia Limitations

Treatment Plant	Percent of Time Ammonia Discharge is Limited			
	Fall	Winter	Spring	Summer
Lander Street	15	0	0	0
West Boise*	100	75	25	75

*Limitations are based on projected year 2000 wastewater flows at West Boise.

SOURCE: CH2M Hill 1980c.

Energy requirements for the various modification alternatives at the West Boise plant are presented in Table 4-11. The alternative of converting to anaerobic sludge digestion was determined to be the most cost-efficient of the three alternatives (CH2M Hill 1980c).

Sludge Management. An energy use comparison of the various sludge transport alternatives is presented in Table 4-12. The liquid sludge pipeline transport alternative was determined to require the least amount of energy. In addition to sludge transport, approximately 5,700 gallons of diesel fuel and 52,200 kilowatt hours of electricity would be required per year to apply sludge to agricultural land (CH2M Hill 1980).

Project Costs

The costs of the Stage 1 project as proposed are presented in Table 4-13. Stage 2 costs are shown in Table 4-14 and the user costs in Table 4-14. The connection fee shown in Table 4-15 represents a one-time charge at the time of hookup to the sewer system.

User fees for the Boise project alternative are shown on Table 4-15.

Eagle Water and Sewer Facilities

The existing Eagle sewage wastewater plant is considered to be an interim treatment facility. A capacity limit equivalent to 790 dwelling units (population of 2,370) has been imposed by the Idaho Department of Health and Welfare. With the understanding that future facilities would be needed, the Eagle Water and Sewer District (EWSD) purchased a 65-acre site approximately 1 mile downstream from the existing facilities.

J-U-B Engineers, Inc., prepared a facilities plan for the EWSD (May 1980) which presented regionalization, land application, and on-site disposal options. The project planning and study area boundaries are shown in Figure 4-6. The 65-acre proposed treatment plant site Southwest of Eagle along the North Fork of the Boise River is in an emergency flood risk zone (FEMA pers. comm. 1981) and no official floodplain has yet been established. This location appears to be subject to EPA floodplain and wetlands policy analyses.

Development of the area in question may be incompatible with the Ada County Flood Control Ordinance (Minter 1981).

Table 4-11. Process Energy Consumption for West Boise Alternatives

	ENERGY REQUIREMENTS (horsepower)[a]					
	Alternative No. 1 Aerobic Digestion		Alternative No. 2 Anaerobic Digestion		Alternative No. 3 Aerobic Digestion With Primary Clarification and Flotation Thickening	
	1990	2000	1990	2000	1990	2000
Effluent Pumping	180	290	180	290	180	290
Grit Removal	--	--	7	14	--	--
Screening and Grinding	4	8	4	8	4	8
Primary Clarification	--	--	4	8	4	8
Aeration Basins	670	1,140	520	890	520	890
Secondary Clarification	8	16	8	14	8	14
Postaeration	50	80	50	80	50	80
Cavity Thickening	--	--	1	1	--	--
Flotation Thickening	--	--	55	55	55	55
Sludge Pumping	75	120	65	115	70	115
Aerobic Digestion	430	850	--	--	450	750
Anaerobic Digestion	--	--	100[b]	145[b]	--	--
Total Energy Required (hp)	1,417	2,504	994	1,620	1,341	2,210
Digester Gas Heating Value (therms/year)	0	0	202,000	370,000	0	0
Digester Heating Requirements (therms/year)	0	0	95,000	139,000	0	0
Electrical Energy Generation (hp)[c]	0	0	195	360	0	0
Net Electrical Energy Required						
o Horsepower	1,417	2,504	799	1,260	1,341	2,210
o Kilowatt-hours/MGD	1,691	1,830	953	920	1,601	1,615

[a] Based on average annual flow rates of 15.0 MGD in 1990 and 24.5 MGD in 2000.

[b] Excludes digester sludge heating requirements.

[c] Based on the following assumptions: Gas engine availability = 85 percent.
Engine generator efficiency = 25 percent.
Gas engine heat recovery efficiency = 50 percent.
Boiler efficiency = 80 percent.

SOURCE: CH2M Hill October 1980c.

Table 4-12. Energy Consumption for Sludge Transportation Alternatives[a]

Item	Liquid Sludge Pipeline Transport	Liquid Sludge Truck Transport	Dewatered Sludge Truck Transport	Liquid Sludge Pipeline/Truck Transport
Electrical Energy (kWh/yr)	330,300	--	1,143,000	219,900
Diesel Fuel (gal/yr)	--	42,000	6,480	15,050
Total Annual Cost ($/yr)[b]	8,000	48,000	35,000	22,900

---

[a] Electrical energy and diesel fuel quantities are based on average annual quantities in the year 1990.

[b] Annual costs are in December 1980 dollars: Electrical energy cost = $0.01915/kWh + $2.60/kW-month demand. Diesel fuel cost = $1.15/gal.

SOURCE: CH2M Hill October 1980c.

Table 4-13. Recommended Alternatives Cost Estimate Summary[a]

STAGE ONE EXPANSIONS - 1983

Alternative	Capital Cost	Annual O&M Cost	Salvage Value	Total Present Worth[b]
West Boise Expansion	$ 8,295,000	$585,000/yr	$4,125,000	$ 9,620,000
Lander Street Improvements	196,000	41,000	118,000	518,000
Sludge Pipeline	3,463,000	66,000	1,795,000	3,660,000
Agricultural Application	584,000	39,000	378,000	839,000
South Boise Interceptor[d]	2,989,000	12,000	–	3,115,000
North Boise Interceptor	4,151,000	16,000	–	4,319,000
Miscellaneous Interceptors	2,461,000	10,000	–	2,566,000
Flow Augmentation	–	100,000[c]	–	1,049,000
TOTAL	$22,139,000	$869,000	$6,416,000	$25,686,000

[a] All estimates are in December 1980 dollars.

[b] Present worth estimates are based on a 20-year design period and a 7-1/8 percent discount rate.

[c] Estimate is preliminary and may change depending upon availability of unallocated storage in Lucky Peak Reservoir.

[d] Extension to Americana Boulevard (Construction may be staged with completion to intercept with Bench Sewer District by 1983, and remainder perhaps in Stage 2).

SOURCE: CH2M Hill 1980a.

Table 4-14. Recommended Alternatives Cost Estimate Summary[a]

STAGE TWO EXPANSIONS - LATE 1980's

Alternative	Capital Cost	Annual O&M Cost	Salvage Value	Total Present Worth[b]
West Boise Expansion	$13,700,000	$1,135,000/yr	$6,350,000	$14,585,000
South Boise Interceptor[c]	2,147,000	8,000	–	2,231,000
TOTAL	$15,847,000	$1,143,000	$6,350,000	$16,816,000

[a] All estimates are in December 1980 dollars.

[b] Present worth estimates are based on a 20-year design period and a 7-1/8 percent discount rate.

[c] Extensions east of Americana Boulevard.

SOURCE: CH2M Hill 1980a.

Table 4-15. User Impacts[a] City of Boise Alternative

	User Charge System	Treatment Plant and Major Interceptor Connection Fee
1980 Average	$ 7.70/month[b]	$165
Average After Stage 1 (1983) Expansion	8.60	221
Average After Stage 2 (late 1980s) Expansion	9.20	224

[a] All rates are given in 1980 dollars for typical domestic household.

[b] Actual rate for specific customer will depend on water use. Average assumes 790 cubic feet per month.

SOURCE: CH2M Hill 1980a.

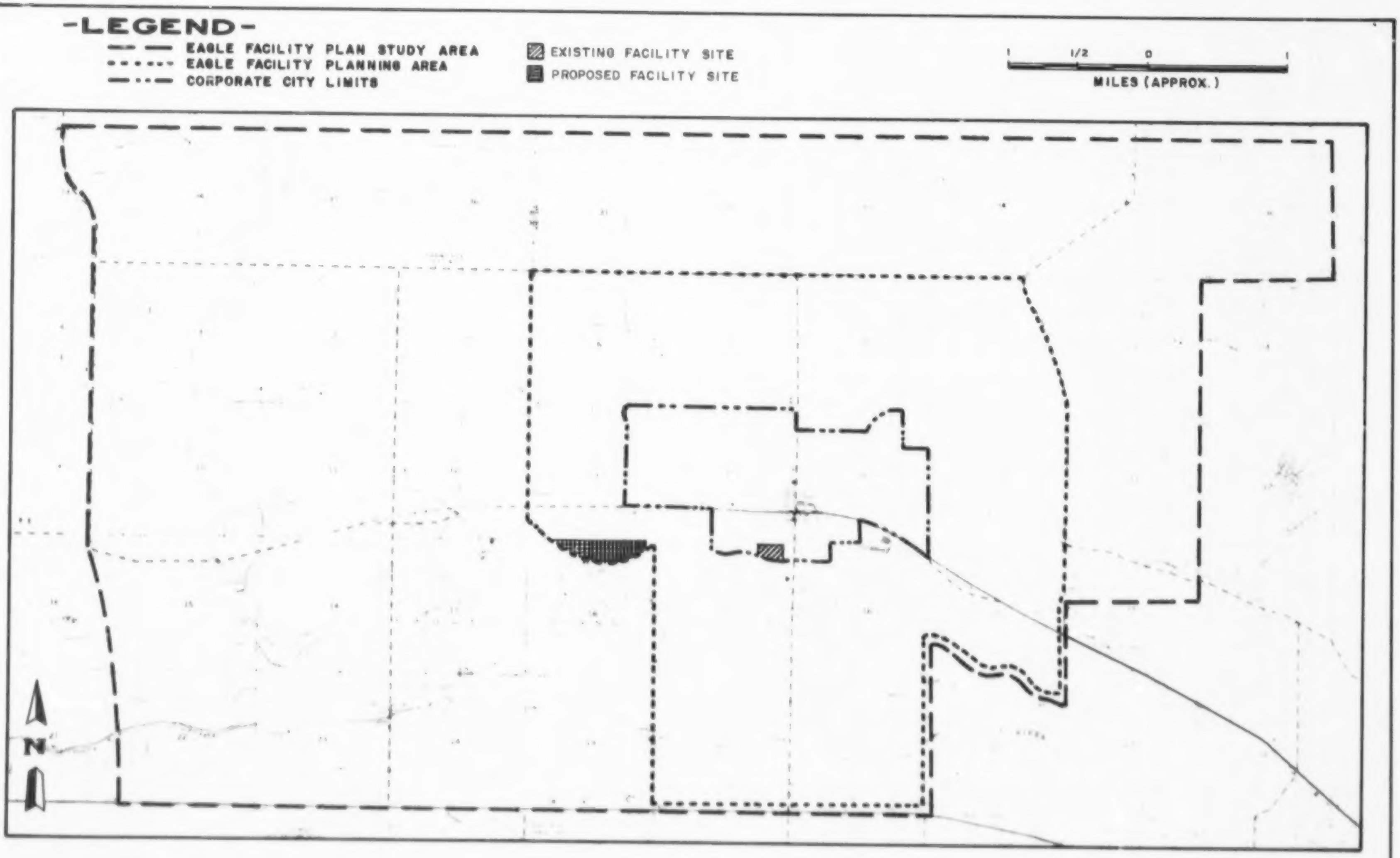

-LEGEND-
EAGLE FACILITY PLAN STUDY AREA
EAGLE FACILITY PLANNING AREA
CORPORATE CITY LIMITS
EXISTING FACILITY SITE
PROPOSED FACILITY SITE
1
1/2
0
1
MILES (APPROX.)
N

FIGURE 4-6. FACILITY PLANNING AREAS FOR THE EAGLE WATER AND SEWER DISTRICT

The Army Corps of Engineers has completed a ground control survey and is currently developing new cross sections in the area which should be completed in approximately 2 months and which will aid in the development of the floodplain boundaries (Fintel January 1981).

A request has been submitted to the District Engineer in Walla Walla, Washington for floodplain information as soon as it is available.

Flow and Waste Load Projections

Flow and waste load projections for the EWSD planning area were based on two population scenarios - the J-U-B projections and APA projections (Table 4-16). Flows for each population scenario in Table 4-16 are shown both with and without infiltration and inflow removal.

Three flow estimates were utilized for cost estimating in the facilities plan: 1) the year 2000 APA projections with infiltration/inflow removal (0.8874 MGD), 2) the year 2000 J-U-B projection with infiltration/inflow removal (1.1532 MGD), and 3) the year 2000 J-U-B projection without infiltration/inflow removal (1.3082 MGD).

Treatment Alternatives

Five project alternatives were analyzed by J-U-B Engineers. These alternatives along with the no-action alternative are described herein.

No-Action Alternative. The no-action alternative would be represented by the continued operation of the present treatment system. The sand filter treatment is operating within secondary treatment standards and would probably continue to do so under present loading levels (population equivalent of 2,370). While no additional hookups to the sewer system would occur, some residential development would occur utilizing individual subsurface disposal systems.

Alternative A - Oxidation Ditch. This alternative would consist of pumping, pretreatment, oxidation ditch with rotating aerators, secondary clarifiers, disinfection and sludge handling facilities located at the new 65-acre site owned by EWSD. Construction of the facility would be staged according to population growth.

Effluent from the disinfection facility (chlorine contact chamber) would be discharged through a diffuser into the North Channel of the Boise River. Sludge from the clarifiers would be held in an equalization basin until applied to land by injector truck. The sludge disposal site has not yet been determined.

Table 4-16. Flow and Waste Load Projections - Eagle

J-U-B PROJECTIONS

Year	Area Population	Service* Population	Population Increase	Change In Flow	60 gal/cap/day Base Flow	Existing Removable I/I Infiltration	Existing Non-Removable I/I Infiltration	Change In Allowable I/I	250 gal/hc/day Allowable I/I	Flow Less Removable I/I	Total Flow
1979	4581	2370	--	--	0.1415	0.155	0.0535	--	0.0535	0.1950	0.35
1985	6210	4552	2182	0.1309	0.2724	0.155	0.0535	0.0606	0.1141	0.3865	0.5415
1990	8002	6897	2345	0.1407	0.4131	0.155	0.0535	0.0651	0.1792	0.5923	0.7473
1995	10,311	9759	2862	0.1717	0.5848	0.155	0.0535	0.0795	0.2587	0.8435	0.9985
2000	13,286	13,286	3527	0.2117	0.7965	0.155	0.0535	0.0980	0.3567	1.1532	1.3082

APA PROJECTIONS

Year	Area Population	Service* Population	Population Increase	Change In Flow	60 gal/cap/day Base Flow	Existing Removable I/I Infiltration	Existing Non-Removable I/I Infiltration	Change In Allowable I/I	250 gal/hc/day Allowable I/I	Flow Less Removable I/I	Total Flow
1979	4581	2370	--	--	0.1415	0.155	0.0535	--	0.0535	0.1950	0.35
1985	5125	3467	1097	0.0658	0.2073	0.155	0.0535	0.0305	0.0840	0.2913	0.4463
1990	6552	5447	1980	0.1188	0.3261	0.155	0.0535	0.055	0.1390	0.4651	0.6201
1995	8329	7777	2330	0.1398	0.4659	0.155	0.0535	0.0647	0.2037	0.6696	0.8246
2000	10,255	10,256	2478	0.1487	0.6146	0.155	0.0535	0.0691	0.2728	0.8874	1.0424

*It is assumed that the present population in the service area not sewered, will be sewered at a rate of 5% per year or 110 persons per year.

SOURCE: J-U-B May 1980.

Alternative B - Pump to West Boise Treatment Plant. This alternative would require pretreatment (screening grit removal and flow measurement), a pumping station and 19,000 feet of pressurized pipeline from the new treatment plant site to the West Boise treatment plant. The pipeline would require two river crossings.

Alternative C - Land Application by Irrigation. The alternative of applying wastewater by slow rate disposal method would have the following project components: pretreatment (screening); pumping station; aerated lagoons; storage lagoons of either 35, 45, or 50 acres (for storage of approximately 125 days of wastewater flows); disinfection; application system; and 250-325 acres of land.

Alternative D - Rapid Infiltration. Rapid infiltration was the second land disposal option evaluated. While no specific disposal site was defined by J-U-B Engineers (1980), it was assumed that "suitable soil and groundwater conditions exist within reasonable distance from the treatment plant site". The components of the alternative would include pretreatment, a lift station, aerated lagoon, equalization lagoons, pump stations and rapid infiltration basins. Observation wells would be constructed to monitor groundwater quality.

Alternative E - On-Site Disposal. This alternative would represent a combination of on-site community septic systems and construction of a new 0.55 MGD treatment plant (J-U-B Engineers 1980).

Ada County presently requires a 1-acre minimum lot size for an on-site disposal system and a well. If central water is provided, the minimum lot size required is .5 acre. Within the planning area, approximately 400 homes are presently being served by individual on-site systems and another 500 units would likely be developed utilizing subsurface disposal. Since the existing sewage treatment facilities are "at capacity" (equivalent of 790 dwelling units), any future growth would require on-site systems or a community septic system.

The community septic system would allow connection of a maximum of 70 dwelling units to a compartmentalized septic tank and parallel drainfield. Septic tanks would be pumped once every 2 years and septage disposed of at the existing EWSD treatment facility.

Interceptor Systems

The proposed interceptor system would be common to all alternatives except no-action and Alternative E (on-site disposal). Sizing of the interceptor system would be based on a 50-year growth projection in the planning area. EPA will fund for only a 40-year growth period. Any remaining capacity would have to be funded locally. A proposed layout of the interceptor system appears as the "Master Plan Map" in the "Step 1 Facility Plan - Eagle Water and Sewer District" prepared by J-U-B Engineers, Inc. (1980).

Energy Requirements

The energy requirements (in total horsepower) for the five project alternatives are shown in Table 4-17. The energy equivalent in kilowatt hours and energy costs were not presented in the facilities plan. Alternative D (rapid infiltration) with a 1.3082 MGD treatment capacity, the alternative preferred by EWSD, would be the most energy efficient (J-U-B Engineers 1980).

Project Costs

The costs for all project alternatives except no-action and Alternative E (on-site disposal) were based on the three different sized treatment plants previously mentioned - 0.8874 MGD; 1.1532 MGD and 1,3082 MGD, and are shown in Table 4-18. These represent present worth, total annual costs and annual operation and maintenance.

Table 4-19 shows the capital costs of each alternative. These represent total project costs and do no reflect any grant assistance. Historically, the EPA has provided 75 percent of eligible capital costs with Idaho Department of Health and Welfare granting an additional 15 percent. The remaining 10 percent represents the local share. Annual operation and maintenance costs would not be grant eligible and must be borne by the EWSD. The EWSD board has selected rapid infiltration with discharge to the Boise River (Alternative D), as the preferred alternative. The proposed 20-year plant capacity is 1.3082 MGD which is based upon the projected service area population of 13,286. The oxidation ditch and discharge to the Boise River (Alternative A) may be considered the back-up alternative (Vickers pers. comm. 1981).

User fees for the Eagle project alternative were not available for this DEIS but will be presented in the FEIS.

Table 4-17. Primary Energy Consumption

	Oxidation Ditch			Pump to West Boise Plant			Land Application by Irrigation			Rapid Infiltration			On-Site Disposal		
Alternative	A			B			C			D			E		
Treatment Plant Size*	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Primary Energy Consumption (horsepower)	75	100	105	77	127	152	105	165	170	65	95	100	80	---	---

*1 - 0.8874 MGD
2 - 1.1532 MGD
3 - 1.3082 MGD

SOURCE: J-U-B 1980.

Table 4-18. Present Worth and Annual Operation and Maintenance Costs of Project Alternatives - Eagle Water and Sewer District

Alternative A
Oxidation Ditch

COST ITEM	COST FOR EACH SIZE OF TREATMENT PLANT		
	.8874 MGD*	1.1532 MGD**	1.3082 MGD***
Construction	1,515,000	1,965,000	2,226,000
Non-Construction	193,000	251,000	283,000
O&M Costs	556,000	619,000	654,000
Total Present Worth	2,264,000	2,835,000	3,163,000
Total Annual Cost	216,000	270,000	302,000
Annual O&M Cost	53,000	59,000	62,000

Alternative B
Pump to West Boise

COST ITEM	COST FOR EACH SIZE OF TREATMENT PLAN		
	.8874 MGD*	1.1532 MGD**	1.3082 MGD***
Construction (Eagle W&SD)	$906,000	$1,015,000	$1,074,000
Construction & Non-Construction Eagle share of West Boise	2,250,000	2,550,000	2,750,000
Non-Construction (Eagle W&SD)	115,000	128,000	137,000
O&M (Eagle W&SD)	298,000	436,000	480,000
O&M (Eagle share of West Boise)	470,000	600,000	660,000
Total Present Worth	4,039,000	4,729,000	5,101,000
Total Annual Cost	385,000	451,000	486,000
Annual O&M Cost	73,000	99,000	109,000

Alternative C
Land Application - Irrigation

COST ITEM	COST FOR EACH SIZE OF TREATMENT PLANT		
	.8874 MGD*	1.1532 MGD**	1.3082 MGD***
Construction	1,535,000	1,929,000	2,026,000
Non-Construction	337,000	418,000	447,000
O&M Costs	626,000	728,000	747,000
Total Present Worth	2,498,000	3,075,000	3,220,000
Total Annual Cost	238,000	293,000	307,000
Annual O&M Cost	60,000	69,000	71,000

Table 4-18 (cont'd.)

Alternative D
Rapid Infiltration

COST ITEM	COST FOR EACH SIZE OF TREATMENT PLANT		
	.8874 MGD*	1.1532 MGD**	1.3082 MGD***
Construction	1,472,000	1,744,000	1,870,000
Non-Construction	257,000	306,000	340,000
O&M Costs	570,000	631,000	656,000
Total Present Worth	2,299,000	2,681,000	2,866,000
Total Annual Cost	219,000	256,000	273,000
Annual O&M Cost	54,000	60,000	63,000

Alternative E
On-Site Disposal

COST ITEM	COST FOR EACH SIZE OF TREATMENT PLANT 0.8874 MGD****
Construction and Non-Construction	2,380,000
O&M	810,000
Total Present Worth	3,190,000
Total Annual Cost	304,000
Annual O&M Cost	77,000

FROM: J-U-B Engineers May 1980.

The cost components for each alternative discussed are construction, nonconstruction and O&M. The construction component includes installation of all buildings and unit processes, mobilization, site work, electrical and yard piping. The nonconstruction cost component includes administration and legal, engineering and inspection, miscellaneous and contingency. The O&M cost component consists of labor to operate and maintain the various unit processes and maintenance materials.

* Flow projections are based on APA year 2000 population with I/I removal.

** Flow projections are based on J-U-B year 2000 population with I/I removal.

*** J-U-B projection of total flow without I/I removal.

****The Eagle District facilities plan states that a treatment plant of a minimum flow of 0.55 MGD will be required.

Table 4-19. Cost Summary - Eagle

ALTERNATIVE	A			B			C*			D			E		
	1**	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Capital (1000 dollars)	1,708	2,216	2,509	3,271	3,693	3,961	1,872	2,347	2,473	1,729	2,050	2,210	3,584	---	---
Annual O & M (1000 dollars)	53	59	62	73	99	109	60	69	71	54	60	63	58	---	---
Total Annual Cost (1000 dollars)	216	270	302	385	451	486	238	293	307	219	256	273	342	---	---

* Cost of transmission not included.
** 1 - 0.8874 MGD; 2 - 1.1532 MGD; 3 - 1.3085 MGD.

SOURCE: J-U-B May 1980.

Southwest Community

Rapid population growth in the Southwest community during the period from 1970-1978, resulted in a number of steps designed to provide orderly future development of the area:

- 1978 - The Board of Ada County Commissioners passed a moratorium on additional platting in the Southwest community.
- February 1979 - The County Commissioners adopted the Southwest Interim Development District Ordinance (SWIDD).
- 1979 - The Ada Planning Association (APA) initiated preparation of the Southwest Community Wastewater Management Plan.

During early APA planning efforts, 39 wastewater treatment and disposal alternatives were evaluated and reduced to 10 warranting further consideration. Based on public input and decisions regarding development density, the 10 alternatives were narrowed to three structural alternatives and the no-action option. Those alternatives were:

- Central wastewater collection system and treatment at the West Boise treatment plant.
- Central wastewater collection and treatment at a Southwest community wastewater treatment plant with land disposal of effluent.
- Wastewater collection and treatment at community lagoons with land disposal of effluent at separate sites or a common site.
- No-action.

As a result of negative public reaction to costs of the alternatives, three variations to the alternatives were evaluated. These three variations were: Plan "A" Urban Growth, Plan "B" Urban Reserve, and Plan "C" Rural Lifestyle. In August 1980 the Board of Ada County Commissioners adopted Plan C - rural lifestyle land use plan allowing for 1 unit per 5 acres.

As a result of that decision, the use of individual on-site surface disposal systems became the only feasible wastewater management alternative for the Southwest community (APA 1980). In order to ensure some level of proper operation and maintenance of septic systems, the Southwest Community Wastewater Management Study set forth a number of maintenance program alternatives.

Operation and Maintenance Program Alternatives

Three broad programs and a number of cases within each were analyzed.

Mandatory Operation and Maintenance Program.

Case I. With this alternative an advisory agency would be given authority to issue renewable use permits for subsurface systems. Inspection would be conducted every 3 years and any needed repairs made by the homeowner. A permit fee would be levied to finance operational costs of the program. Licensed contractors would do the inspection, repairs and any necessary pumping.

Case II. The Case II mandatory operation and maintenance program would include all inspection maintenance and repairs conducted by the public agency, with homeowners charged an annual fee plus costs of system repairs. Easements through private property would be necessary for maintenance and repair.

Case III. The Case III option would involve ownership, maintenance, and repair of septic systems. An annual fee would be levied to finance inspection and repair, with all users charged the same fee, no matter what the needed repair and maintenance.

Volunteer/Mandatory Operation and Maintenance Program. This combination program would involve a volunteer or optional mandatory program for all homeowners now on septic systems, with mandatory participation by homeowners with failing septic systems, and those constructing homes after implementation of the maintenance program.

Volunteer Operation and Maintenance Program. The volunteer program would include the establishment of a public education program and the mailing of notices to remind homeowners to inspect their systems.

No-Action Program. The no-action alternative would represent a continuation of the present system of allowing all maintenance to be the responsibility of homeowners.

Costs

The estimated annual costs of the operation and maintenance programs are presented in Table 4-20.

Best Management Plan

APA identified the following factors as important in a best management plan:

- Identification of portions of rural Ada County with high septic system failure rates and comparison of characteristics of such areas to determine causes of the failures.

Table 4-20. Monetary Cost Analysis of On-Site Management Program Alternatives - Southwest Area

Inspection Alternatives	Annual Costs to the Agency Per Community*				
	Maintenance Staff	Clerical Staff	Staff	Materials	Total
Mandatory Permit Program	-	-	$2,500	-	$ 2,500
Mandatory O&M Program for Private Systems	$25,000	$ 50,000	$2,000	$40,000	$117,000
Mandatory O&M Program with System Ownership	$30,000	$250,000	$2,000	$40,000	$286,000
Voluntary Program	-	-	-	-	-
Voluntary/Mandatory Permit Program	-	-	$2,500	-	$ 2,500
Groundwater Monitoring	-	$ 2,000	-	$ 6,000	$ 8,000

*Assume 2,000 septic systems/community.

SOURCE: APA 1980.

- Modification of design criteria established by Central District Health Department (CDHD) to decrease the number of septic system failures due to identified study area characteristics.

- Establishment of a map of rural Ada County that indicates locations of septic system failures. The map would be continually updated to include locations of new failures. (This is currently being done).

- Establishment of a coordinated groundwater monitoring program.

- Development of a public education program for residents and commercial establishments.

- Development of a voluntary/mandatory maintenance program.

- Establish a user fee schedule to fund the program.

The recommended plan for a maintenance program would be for CDHD (in cooperation with IDHW and APA) to implement a combination voluntary/mandatory maintenance program for individual on-site systems.

Chapter 5

ANALYSIS OF FACILITY PLANNING POPULATION PROJECTIONS

Introduction

Population projections prepared in conjunction with wastewater facility planning are used to determine projected wastewater flows. The projected flows provide the basis for the sizing of wastewater treatment facilities. In addition, population projections are used in environmental impact assessments to assess potential secondary impacts of growth accommodated by wastewater plans and to develop possible mitigation measures.

This chapter summarizes the key issues associated with facility planning population projections. Additional information can be found in Appendix C.

EPA Policy on Population Projections for Facilities Planning

EPA's policy for population projections to be used for facilities planning is presented in Appendix A of the agency's cost-effectiveness analysis guidelines (U. S. EPA 1978a). The policy requires wastewater facilities plans to use population projections developed by states or appearing in approved 208 plans, provided that state projections do not exceed Bureau of Economic Analysis (BEA) projections by more than 5 percent, and that 208 plan projections do not exceed state projections by more than 10 percent. New BEA projections are currently being developed in conjunction with the federal Office of Management and Budget (OMB). These new projections are not expected to be completed until late 1981.

EPA Approved Population Projections for Facilities Planning in Ada County

The state baseline population projection for facilities planning was developed by the Bureau of Water Quality (BWQ) and approved by EPA in January 1980. The BWQ projection for Ada County in the year 2000 was 268,622. This projection was subsequently revised to 289,000, and submitted to EPA, which approved the revised projections in March 1980.

In August 1978, Ada Planning Association (APA) adopted the report Demographic and Employment Distribution (DED) to Year 2000. This report presents population and employment projections in 5-year intervals for Ada County and for smaller statistical areas. The DED projections were adopted as the population projection baseline for all APA regional planning programs, including 208 areawide waste treatment management planning. A summary of the DED population projections is presented in Table 5-1.

Description of Facility Planning Population Projections

Boise Planning Area

The Boise planning area corresponds to the Boise Metropolitan Area with the exception of the Southwest area (see Figure 4-6). The population projections prepared by the facilities plan consultants were based on the DED projections. The population projection in the Boise facilities plan for year 2000 is 212,145 (Table 4-4). This compares with 211,945 in the DED study for the year 2000.

Southwest Planning Area

A comprehensive land use plan was adopted for the Southwest planning area in August 1980. This land use plan, referred to as Plan "C" - rural lifestyle, allows a maximum density allowance of 1 unit per 5 acres for all new development in areas designated "rural residential". Based on the adopted land use plan, the population projected by APA for the year 2000 is 18,985.

As shown in Table 5-1, the adopted 208 (DED) projection for the Southwest area in the year 2000 is 22,380. The difference between the DED projection and the most recent APA projection is 3,395 persons. This additional population projected for the Southwest planning area has been allocated by APA to the Eagle sewer service area (Minter pers. comm.).

Eagle Planning Area

The DED projection for Eagle in the year 2000 is 10,255. Although this projection is the adopted 208 plan projection, APA has acknowledged that this projection is probably low (Minter pers. comm.). With the addition of 3,395 persons formerly allocated to the Southwest area the revised APA projection for the Eagle planning area is approximately 13,600. As a result, the DED projection for Eagle has been modified.

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Table 5-1. Summary of DED Planning Area Population Projections

	1975	Additional	2000	Year 2000 (% of Total)
Southeast	11,425	42,100	53,525	18.5
North River	35,650	34,300	69,950	24.2
City Center	2,940	3,715	6,655	2.3
North End	17,180	930	18,110	6.3
Northwest	5,310	19,145	24,455	8.5
Foothills	6,725	8,431	15,156	5.2
Warm Springs	3,495	2,079	5,574	1.9
West Bench*	28,700	16,415	45,115	15.6
Central Bench	36,105	7,250	43,355	15.0
Southwest	9,080	13,300	22,380	7.7
Total Metro	120,960	113,365	234,325	81.1
Meridian	6,349	18,801	25,150	8.7
Eagle	2,720	7,505	10,225	3.5
Kuna	1,308	5,517	6,825	2.4
Rural Area**	8,063	4,412	12,475	4.3
Total Nonmetro	18,440	36,235	54,675	18.9
Total Ada County	139,400	149,600	289,000	100.0

* Includes Garden City

**Includes Star

SOURCE: Ada Planning Association, 1978. Demographic and Employment Distribution to the Year 2000: Ada County, Idaho.

In the Eagle facilities plan, two population projections have been developed for the year 2000. The two projections, 13,286 and 16,019, are a result of different development assumptions. The lower projection does not assume the development of a major employment source while the higher projection does reflect the development of a major employment source. Potentially, both population projections could be increased by 1,550 persons if a contingency planning area to the east of Eagle were included in the projections.

Growth Accommodated by Facility Plans

Introduction

The timely phasing of wastewater facilities is an important element in cost-effective wastewater facility planning. Constructing facilities for the short term can involve cost penalties associated with additional planning efforts and financing arrangements. In contrast, the construction of facilities with too much capacity commonly involves the inefficient operation of facilities as well as a commitment of resources which otherwise might have been available for other public purposes. In addition, excessive capacity in treatment facilities can be an important growth-inducing influence. An evaluation of the staging of treatment facilities and the growth accommodated in the facility planning area is presented here.

Boise Facility Planning

Facilities planning in Boise is separated into two stages. Stage 1 involves minor modifications at the Lander Street treatment plant to meet effluent discharge requirements. No additional hydraulic capacity will be developed. Diversion of some of the existing flow at Lander Street to West Boise will provide capacity for some additional growth. Based on projected flows, capacity will be reached at the Lander Street plant sometime after the year 2000.

In addition to the Lander Street modifications, Stage 1 includes expansion of the West Boise treatment plant from the current peak capacity of 6.3 MGD to 17 MGD. Based on projected flows, the West Boise treatment plant will reach its Stage 1 capacity about 1987. At that time, approximately 44,548 additional persons from 1978 estimates (Table 4-4) will be provided sewer service. Of this total, about 81 percent or 36,070 persons will be new growth. The remaining 8,478 persons (19 percent) to be provided sewer service are existing unsewered residents.

Stage 2 involves construction of an additional 17 MGD capacity treatment plant adjacent to the West Boise treatment facilities. This expansion should have sufficient capacity to serve the City of Boise's wastewater needs beyond the year 2000. It is projected that all residents in the planning area will have sewer service by the year 2000.

Eagle Facility Planning

Facilities planning in Eagle involves a one-time construction of treatment facilities. It is estimated by the facility plan consultants (J-U-B Engineers 1980) that, as of 1979, 2,370 persons out of a total population of 4,581 in the planning area, were provided sewer service. By the year 2000, it is projected by J-U-B Engineers that all population within the Eagle planning area will be provided sewer service. Depending on which population projection is selected for facilities planning, the sewered population at the year 2000 will range from a low of 10,256 to a high of approximately 17,500 (if all contingency areas are included).

It appears that some inconsistency exists between the projected population to be serviced (Table 4-14) and the serviceable population. It is recognized by J-U-B Engineers that not all populations in the facility planning area will be of sufficient density to warrant sewer service. However, the total population in the facility planning area has been used to estimate projected flows. This includes extending sewer service to all existing populations.

Indirect Impacts of Growth

The growth projected in this study will result in a number of indirect impacts to the environment. These impacts are identified and discussed in the following chapter where relevant.

Summary

EPA's policy on funding wastewater treatment facilities requires that facility plans be consistent with population projections used in approved areawide water quality management plans or the projections developed by the state. In Ada County, the DED projections are used as the baseline for wastewater facility planning. The population projections in the Boise facility plan appear consistent with the approved population projections. The population projections in the Eagle facility plan are higher than the initial 208 projections. The lower population projection in the Eagle facility plan is, however, consistent with APA's latest population allocation. The most recent population projections for the Southwest area are lower than the approved 208 projections.

The proposed two-phased construction of wastewater facilities in Boise will require Phase 2 to be in operation by 1987. Once operating, Phase 2 should provide treatment capacity for Boise until sometime after the year 2000. In Eagle, the one-time construction of wastewater facilities should provide capacity to the year 2000. The number of residents that will be provided sewer service in the year 2000 is uncertain at this time.

Chapter 6

LAND USE CONDITIONS AND TRENDS

Introduction

An important question to be addressed in this EIS is how the existing land use conditions will change as a result of future development. With a rapid population increase expected in Ada County over the next 20 years, significant land use changes will occur. Comprehensive plans have been prepared to provide guidance for directing this growth, but private development pressures often become an overriding influence in the absence of strong land use controls.

EPA's policy on funding wastewater treatment projects requires that facility plans use population projections developed by the state or those used in approved areawide water quality management plans. The population projections in the Demographic and Employment Distribution (DED) report of the Ada Planning Association (APA) (1978) serve as this baseline forecast. The DED forecasts have been used for all of the areawide planning undertaken by APA.

Land Use Planning Framework

The Idaho Local Planning Act of 1975 establishes the framework for local government comprehensive planning. The law requires all cities and counties to prepare general plans, provides that certain elements be included in local plans, and requires that zoning be consistent with local plans. The State Planning Act also requires that local plans designate "areas of city impact". The "areas of city impact" are to be negotiated between the county and the incorporated cities. The purpose in defining "areas of city impact" is to identify areas surrounding the cities where land use and other policies are important for successful implementation of both county and city goals (Ada County Planning Commission 1977). Figure 6-1 presents preliminary recommendations for "area of city impact" submitted by Boise and Eagle.

In accordance with the State Planning Act, the Ada County Comprehensive Plan was adopted in June 1977. This plan uses the "urban service planning area" (USPA) concept. The USPA is defined as the area which each city intends to provide with sewer and other "urban-type" services. The USPAs within the study area are identified in Figure 6-1. As can be seen from Figure 6-1, the USPA is generally smaller than the area of city impact.

Study Area Characteristics

Wastewater Facility Planning Areas

Boise Sewer Service Area. Sewage treatment facility planning in the Boise Metropolitan Area is the responsibility of the City of Boise. The facility planning area (20-year service area) is presented in Figure 3-2. The boundary of the facility planning area generally corresponds to the boundary established in the policy plan for the Boise Metropolitan Area (Boise Planning and Zoning Department 1978). However, the facility planning area includes Garden City and excludes the unincorporated area south of Interstate 80 and west of the airport. Most of this Southwest area has not been included in the facility planning area because it is currently the focus of a separate wastewater management study and land use plan.

The facility planning subareas and the DED population planning subareas are shown in Figures 3-2 and 6-2, respectively. The subarea boundaries do not coincide. The facility planning subareas correspond to engineering requirements based on gravity flow in the sewer lines. The DED population subareas are delineated somewhat differently, based on planning criteria. The total projected population for the Boise planning area in the year 2000 is approximately the same, 212,000 (Barker pers. comm.), under both facilities planning and population planning scenarios.

Southwest Wastewater Management Study Planning Area. The Southwest planning area, shown in Figure 6-1, is the focus of a separate wastewater management study. The Southwest area includes only unincorporated lands and is approximately defined by Interstate 80 on the north, Cloverdale Road on the west, Gowen Field on the east and the New York Canal on the south. Although the Southwest planning area is considered part of the Boise metropolitan area, recent development conditions were considered significant and therefore warranted a separate wastewater management study.

Eagle Sewer Planning Area. The Eagle Sewer and Water District is the agency responsible for Eagle facility planning. The facility planning boundary, changed numerous times since its original designation, is shown in its latest version

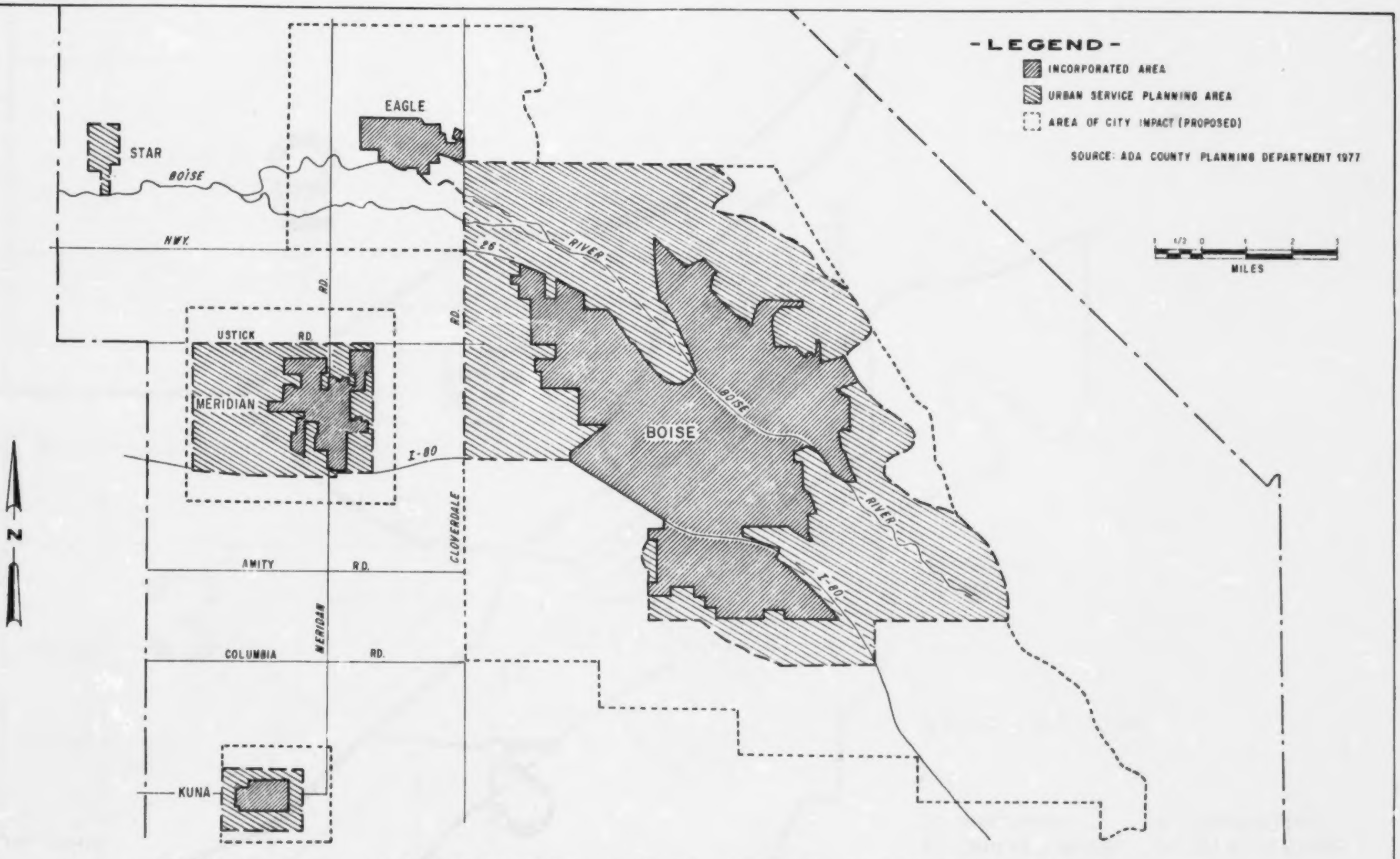

-LEGEND-
▨ INCORPORATED AREA
▨ URBAN SERVICE PLANNING AREA
☐ AREA OF CITY IMPACT (PROPOSED)
SOURCE: ADA COUNTY PLANNING DEPARTMENT 1977
1 1/2 0 1 2 3
MILES
STAR
BOISE
EAGLE
HWY.
26
RIVER
RD.
USTICK RD.
MERIDIAN
BOISE
BOISE
RIVER
I-80
I-80
AMITY RD.
CLOVERDALE
MERIDIAN
COLUMBIA RD.
KUNA
N

FIGURE 6-1 INCORPORATED AREAS, URBAN SERVICE PLANNING AREAS & "AREAS OF CITY IMPACT" IN NORTHERN ADA COUNTY

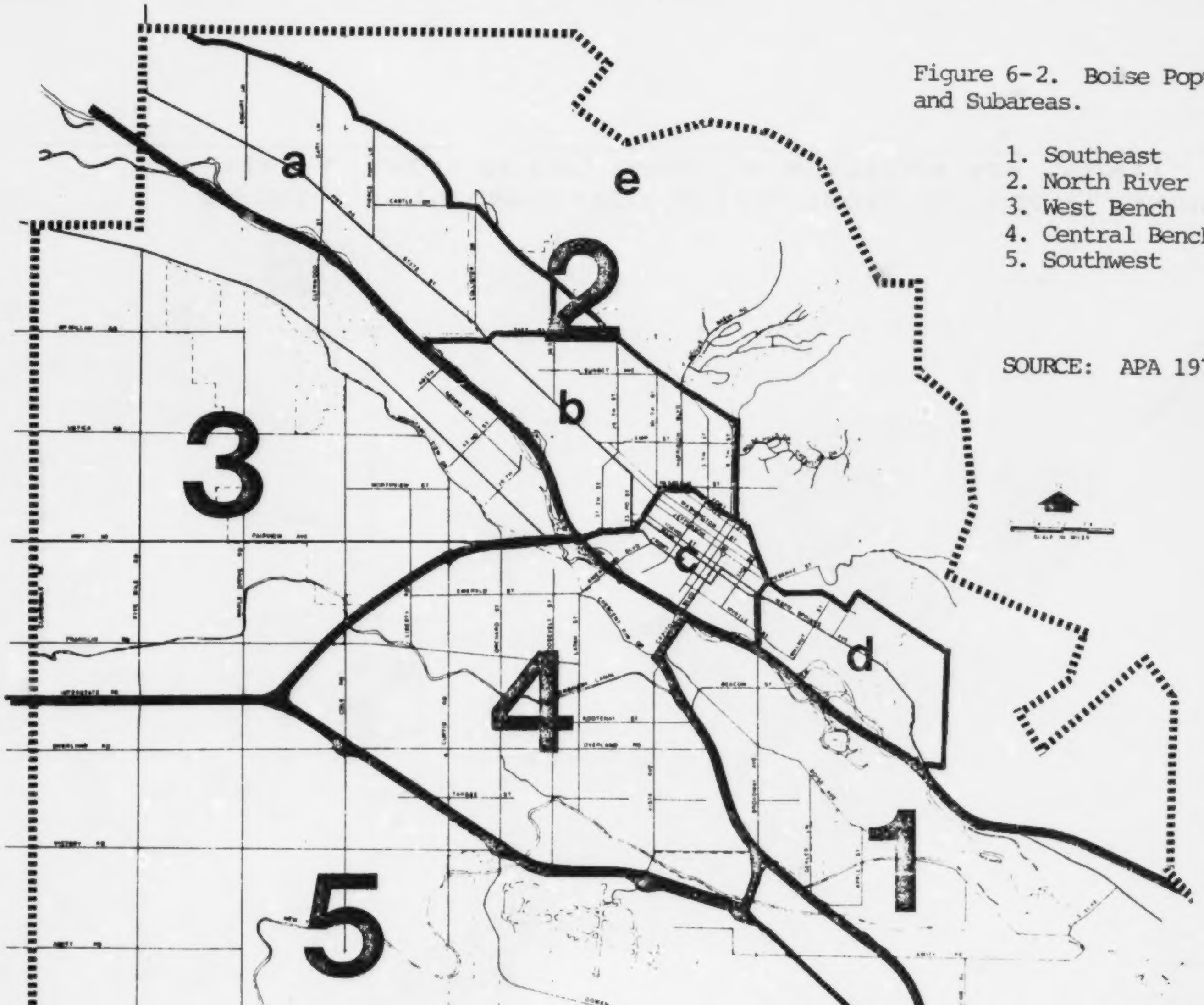


Figure 6-2. Boise Population Planning Area and Subareas.

1. Southeast
2. North River
3. West Bench
4. Central Bench
5. Southwest

a. Northwest
b. North End
c. City Center
d. Warm Springs
e. Foothills

SOURCE: APA 1978a.

in Figure 4-6. One reason for the shift in facility planning boundaries has been to include potential annexations south of Boise River in the facility plan (Blake pers. comm.).

Existing Land Use

Information on existing land use in the study area is limited. The most complete analysis of existing land use in the Boise planning area was completed in 1970 by the Ada Council of Governments (ACOG) (Johnson pers. comm.). More recent information is available for the Southwest planning area as a result of the current wastewater and comprehensive planning efforts. For the Eagle facility planning area, some land use information is available as a result of the Eagle comprehensive planning effort.

Boise Planning Area. In 1975 an analysis of vacant land in the Boise metropolitan area was undertaken to provide land use data for the Boise comprehensive planning effort by the Ada Council of Governments (1975c). This analysis, although somewhat incomplete, provides the most recent land use information for the Boise planning area.

The pattern of existing land use in the Boise planning area is one of relatively dense concentrations of commercial and residential uses in the central region changing to more scattered developments in the outlying areas. Table 6-1 indicates the distribution of vacant land among zoning categories in the incorporated and unincorporated portions of the Boise metropolitan area.

Southwest Planning Area. The existing land use in the Southwest planning area consists primarily of a mixture of residential, suburban and agricultural uses. Approximately 42 percent of the 10,506 total gross acres has been subdivided for residential use at an average gross density of 1.19 dwelling units per acre (APA 1979a). Fifty-two percent of the Southwest planning area is used for agricultural/grazing purposes or is undeveloped. Industrial development in the Southwest planning area is located primarily in the Boise airport influence area at the eastern extreme of the area. Major commercial uses include a community shopping center at Overland Road and Five-Mile Road, a neighborhood shopping center at Five-Mile Road and Lake Hazel Road, and a mixture of commercial and industrial uses at the Interstate 80/Overland Road interchange.

Eagle Planning Area. Much of the Eagle planning area is sparsely populated, consisting of farmland, undeveloped open space, and floodplain. Urban land uses are centered

Table 6-1. 1975 Vacant Land by Zoning Categories in the Boise Metropolitan Area[1]

Land Use Zoning Categories		Acreage of Vacant Land	Percent Vacant	Total Acreage	
				Net	Gross
Unincorporated Area					
Agriculture and Range	D-2	15,567	97	16,064	17,145
	D-1	3	43	7	7
	G-1	9	6	150	152
Residential-	R-1	953	67	1,421	1,505
	R-2	1,632	66	2,488	2,624
	R-2MH	171	36	470	521
	R-3	223	88	253	269
	R-4	548	51	1,075	1,166
	R-5	93	97	96	105
Industrial	M-1	616	58	1,062	1,191
	M-2	307	47	651	727
	M-3	128	100	128	134
Commercial -	C-1, 2, 3	153	55	277	331
Office -	L-O	0	0	0	0
Special Category -	T-1	121	78	156	161
	LF&A	0	0	52	52
SUBTOTAL		20,524	84	24,350	26,090
City of Boise					
Residential-	R-1A, B	436	37	1,189	1,324
	R-1C	985	18	5,432	6,693
	R-2	298	17	1,771	2,337
	R-3	131	25	514	575
Industrial -	M-1, 2, 3	193	9	2,107	2,308
Commercial -	C-1, 2, 3	330	20	1,639	2,044
Office -	L-O	81	29	284	344
Open Space -	A	255	9	2,833	2,989
SUBTOTAL		2,709	17	15,769	18,554
TOTAL ACRES		23,233	58	40,119	44,644

[1] Area includes the Southwest area but excludes Garden City.

SOURCE: ACOG 1975c.

around the City of Eagle, with agricultural, rural residential and undeveloped open space accounting for the bulk of the land uses in the planning area. Table 6-2 presents a summary of land use in the Eagle area.

The existing residential development pattern consists of 3-4 lots per acre subdivisions in the city and large lots (1-5 acre) subdivisions in the rural areas. The commercial and industrial uses are located in the immediate vicinity of Eagle.

Land Use Plans and Policies

The following section reviews the existing comprehensive land use plans within each wastewater planning area and summarizes the development policies.

Boise Planning Area

A policy plan for the Boise Metropolitan Area was adopted by the Boise City Council in October 1978. This policy plan includes the unincorporated Southwest area but excludes the City of Garden City which has adopted its own comprehensive plan.

In projecting a pattern for development in the Boise Metropolitan Area, the policy plan's steering committee suggested a development theme of centrality and compactness. The central city area is to serve as the major employment center for the area. Population growth is encouraged to locate in the southeast and northwest subareas. Improved access from these areas to the central city area is also recommended. Infilling of vacant developable acres within the city is especially encouraged. The city intends to slow the rate of growth in the West Bench subarea.

The implementation of the Boise Policy Plan relies upon an incentive/disincentive approach as opposed to a program based upon strong growth controls. To encourage development in the priority areas, a sewer financing formula provides an incentive to developers through additional city participation in funding (Stacy, pers. comm.). Additionally, improved access in the priority areas has been provided to stimulate growth.

In each planning subarea, target holding capacities have been developed (Table 6-3). To achieve the holding capacities, average dwelling units per gross acre have been recommended. Since these density recommendations reflect

Table 6-2. Land Use in the Eagle's Area of City Impact in 1977

		Acres		Lots/Units
Residential		(1,877.3)		(720)
Less than 10,000 square feet	15		77	
More than 10,000 square feet	741.2		472	
Five acres or more	797.5		115	
Multifamily	11.6		56	
Rural housing	312.0			
Commercial		116.4		
Industrial		112.7		
Public/Government		74.9		
Institutional/School		20.7		
Open Space/Parks		68		
Vacant		(13,811.0)		
More than 10,000 square feet	526.2			
Five acres or more	616.5			
Agriculture	12,668.3			
TOTAL		16,081.0		

SOURCE: Eagle Planning and Zoning Commission 1979.

Table 6-3. Target Holding Capacities for Boise Planning Subareas

Southeast area:	- 4.5 d/u per gross acre
	- PUD's up to 7 d/u per acre except in high density corridor
	- 14 d/u per acre adjacent to floodplain (upon review)
	- 5 - 14 d/u per acre north of Highland Street and east of Broadway
North River:	- 4.5 d/u per gross acre (outside hazard areas)
	- PUD's up to 7 d/u per gross area
	- 14 units per gross acre adjacent to flood plain open space corridor
	- Warm Springs and North End to be reinforced as predominantly single family residential areas
	- Area between 36th Street and Collister Drive to be reinforced as predominantly single family residential areas
	- Area between Hill Road and State Street should provide for residential densities of 4.5 units per gross acre.
West Bench:	- 3.5 d/u per gross acre
	- 4.5 d/u per gross acre for lands located north of the First Bench to the Boise River, exclusive of the floodplain
	- Up to 14 d/u per acre adjacent to the floodplain open space corridor (upon appropriate review.)
	- Larger lots and setbacks should be encouraged on lots abutting I-80.

SOURCE: Boise Planning and Zoning Department 1979.

"average densities" for an entire planning subarea, they provide only a general framework for guiding specific types of development. Specific developments could result in densities greater than those indicated in Table 6-3.

Southwest Planning Area

The 1968 Ada County Comprehensive Plan was the previously adopted plan to guide growth in the Southwest planning area. Development policies in the plan, which called for 1-acre lot subdivisions, have not been implemented. Many subdivisions were approved with 0.5-acre or smaller lots and with no plans for a public sewer system. Land use-related problems have developed as the Southwest's population has increased seven-fold (2,000-14,000) from 1970-1979.

Concern over growth-related problems in the Southwest area resulted in Ada County imposing a zoning and platting moratorium on the area in 1977. The moratorium was replaced in February 1979 by the Southwest Interim Development District Ordinance. The interim ordinance established density limits on various types of development while the Southwest Community Comprehensive Plan was being prepared.

The final draft of the Southwest Community Comprehensive Plan was submitted to the Ada County commissioners in late spring 1980 for consideration. The residential density guidelines recommended in the comprehensive plan were adopted by resolution of the commissioners. These guidelines established a high density and a low density infill plan, dependent on the outcome of the central sewer feasibility study. The high density plan allowed four dwelling units per acre on central sewers in the designated residential part of the Southwest area. The low density plan allowed for two dwelling units per acre on community wastewater systems in the residential part of the area. A density level of 1 unit per 5 acres would have been permitted on individual wastewater systems.

In conjunction with the comprehensive plan, the Southwest wastewater management study has been examining the options in wastewater treatment systems for the Southwest area. At a June workshop on wastewater alternatives, negative public reaction to estimated costs of the alternatives was expressed. As a result, variations of the original alternatives were also discussed. The new alternatives reflected development densities which ranged from 1 unit per 5 acres to 4 units per acre. The new alternatives were discussed further at two additional workshops held in July.

As a result of the workshops on wastewater alternatives and of public hearings on the comprehensive plan, the Board of Ada County Commissioners adopted in August a land use plan for the Southwest community. This land use plan, referred to as the "C"-rural lifestyle, contains a maximum density allowance of 1 unit per 5 acres for all new developments in areas designated "rural residential". Although higher densities could be permitted at some future time, the anticipated population for the Southwest in the year 2000 is 18,985. When complete infilling has occurred, the population is expected to increase to 20,385. The plan's land use map is shown in Figure 6-3.

The development densities adopted in the comprehensive plan eliminates for the present further consideration of central or community wastewater treatment facilities for future development in the Southwest. Individual on-site subsurface disposal systems will continue to be used for wastewater management.

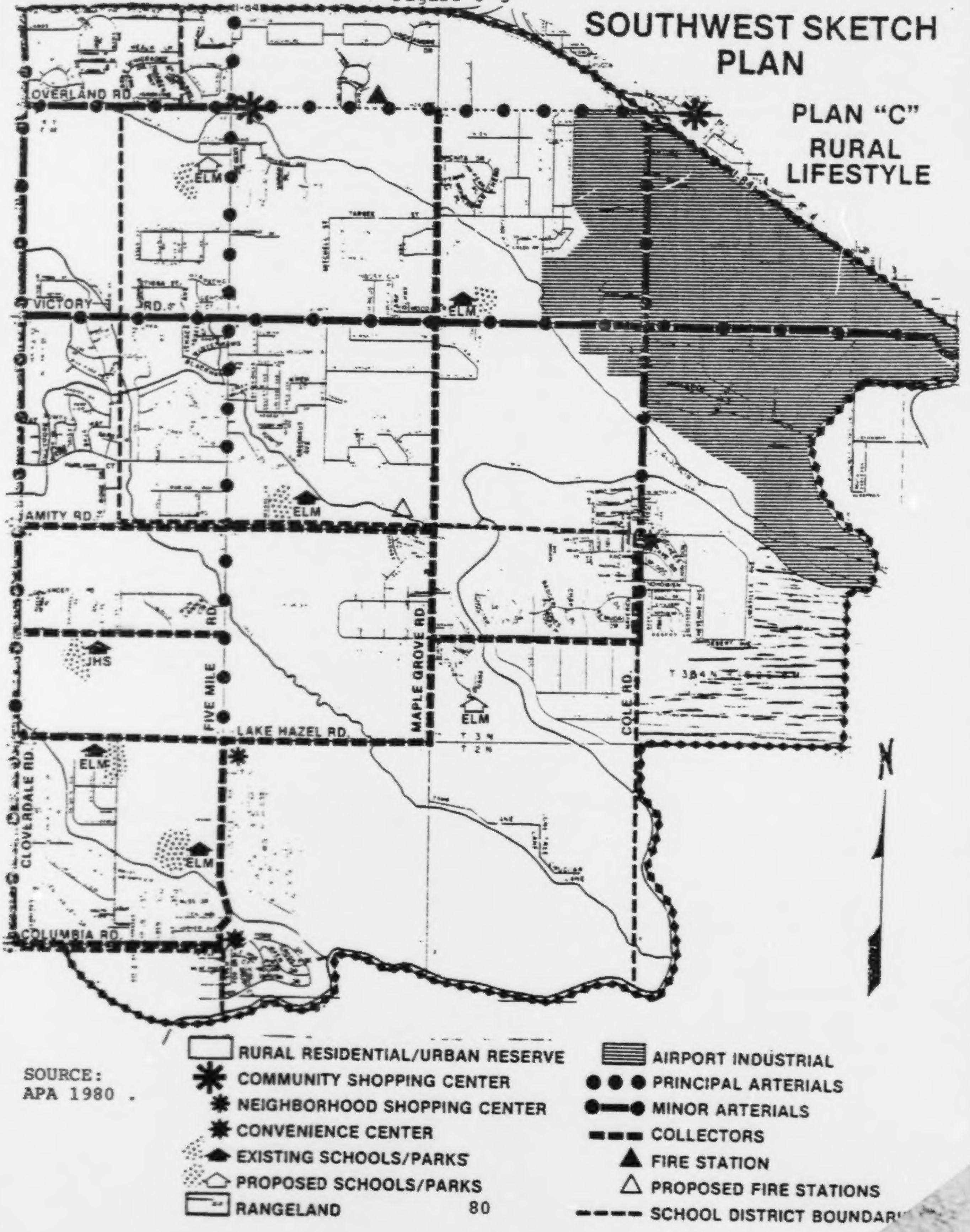
Eagle Planning Area

The Eagle Comprehensive Plan, adopted in 1978, was developed by the Eagle City Council and the Eagle Planning and Zoning Commission. In general, the Eagle planning area is recognized as a rural, suburban bedroom community of the Boise metropolitan area. Efforts are currently under way to amend the Eagle Comprehensive Plan. These amendments focus on the recently proposed Middlebrook project, which may include an industrial park as well as residential development.

Future Land Use

In accommodating future population growth, land use planning efforts and market forces will cause certain development patterns to occur within the study area. The development objective in Ada County's Comprehensive Plan is to accommodate between 92-95 percent of new growth within urban service planning areas. The following section examines future land use conditions that would result from alternative population projections being considered in wastewater planning. Recent development trends from APA's subdivision monitoring program are also covered.

Figure 6-3


SOUTHWEST SKETCH PLAN
PLAN "C"
RURAL LIFESTYLE
OVERLAND RD.
VICTORY RD.
AMITY RD.
LAKE HAZEL RD.
COLUMBIA RD.
CLOVERDALE RD.
FIVE MILE RD.
MAPLE GROVE RD.
COLE RD.
ELM
ELM
ELM
ELM
ELM
ELM
JHS
T 3 N
T 2 N
N
RURAL RESIDENTIAL/URBAN RESERVE
COMMUNITY SHOPPING CENTER
NEIGHBORHOOD SHOPPING CENTER
CONVENIENCE CENTER
EXISTING SCHOOLS/PARKS
PROPOSED SCHOOLS/PARKS
RANGELAND
AIRPORT INDUSTRIAL
PRINCIPAL ARTERIALS
MINOR ARTERIALS
COLLECTORS
FIRE STATION
PROPOSED FIRE STATIONS
SCHOOL DISTRICT BOUNDARY

SOURCE:
APA 1980 .

Boise Planning Area

Based on population projections from the DED study prepared by APA in 1978, the Boise planning area is projected to absorb about 67 percent of the total population growth in Ada County between the years 1975 and 2000. This projected population will be distributed among the four planning subareas (excluding the Southwest area) (see Figure 6-3). The potential for development and the development policies for each planning subarea are evaluated below.

The Southeast Planning Subarea. Table 6-4 indicates that the southeast subarea was relatively undeveloped (9 percent) in 1975, but contained a proportionately high percentage (22 percent) of the total developable acres in the Boise planning area. The southeast is expected to absorb 42 percent of the total additional population projected for the Boise planning area. Recent subdivision activity for the 30 months from mid-1977 to the end of 1979 shows a high rate in platting activity for 1977 and 1978, with a significant leveling off in 1979.

The policy plan for the Boise Metropolitan Area (Boise Planning and Zoning Department 1978) identifies the southeast subarea as a priority development area. The city has proposed certain incentives to promote the development (i.e., utility connections, high densities) and desirability (i.e., improved access, public services) of the area. An additional population of 42,100 between the year 1975 and 2000 has been projected by APA at an "average density" of 4.0 dwellings per acre (APA 1978a).

The North River Planning Subarea. The North River subarea is the largest planning subarea in terms of population and acres in the Boise planning area. It contains almost half (48 percent) of the developable acres in the Boise planning area and is projected to absorb 34 percent of the projected 1975 to 2000 population increase.

The North River planning subarea is delineated into five sections (see Figure 6-2). The northwest section has been designated as a priority development area, with Bogart Lane having been classified as a reserve area for possible urban expansion. In the foothill section, development restrictions have been imposed due to potentially hazardous soil-related conditions.

Recent development activity as evidenced by subdivision platting indicates that the North River subarea has been steadily increasing its share of total platted lots in Ada County (APA 1979b). In the 6-month period ending in

Table 6-4. Allocation of Population and Land by Population Planning Subareas for the Boise Planning Area

	Percent of Population Allocated 1975-2000	Total* Acres (Percent of Total)	Vacant Acres (Percent of Total)	Developable Acres (Percent of Total)	Developed Acres (Percent of Total)
Southeast Planning Subarea	42%	8,494 (19%)	6,642 (28%)	4,262 (22%)	1,852 (9%)
North River Planning Subarea	34%	18,675 (42%)	10,701 (45%)	9,591 (48%)	7,974 (38%)
West Bench Planning Subarea	16%	11,182 (25%)	5,131 (22%)	4,934 (25%)	6,051 (29%)
Central Bench Planning Subarea	7%	6,198 (14%)	1,062 (5%)	986 (5%)	5,136 (24%)

*Total does not add up to 100% due to rounding.

SOURCE: APA 1978.

December 1977, the North River subarea accounted for only 3 percent of the total platted land in Ada County. In the 6-month period ending in December 1979, platted lands in the North River subarea had increased to 14 percent of the Ada County total.

The West Bench Planning Subarea. The West Bench planning subarea contained 25 percent of the developable acres in 1975. It is projected to absorb 16 percent of the projected 1975 to 2000 population growth in the Boise planning area (Table 6-4). The policies to minimize population growth in the West Bench planning subarea are a result of efforts to balance growth and to lessen adverse land use impacts in the area.

Recent development activity over a 30-month period from July 1977 to December 1979 reveals that subdivision platting has been extremely high (around 20 percent of the total plats in Ada County). This high level of activity most likely reflects recent infill of platted land. The current high level of subdivision activity in the West Bench area is expected to level off as the policies encouraging growth elsewhere are implemented.

The Central Bench Subarea. The Central Bench subarea is the most densely developed of the planning subareas. Although it contains 24 percent of the Boise planning area's developed acres, this planning subarea contains only 14 percent of the total acres. With 5 percent of the developable acres in the Boise planning area, the Central Bench subarea is expected to absorb 7 percent of the additional population (1975-2000).

Recent development activity indicates that the Central Bench subarea has maintained a relatively constant rate of the total platting activity in Ada County, around 6 percent of the total platted lands. In general, the Central Bench planning subarea contains a small percentage of developable acres but can be expected to build-out on this remaining acreage.

Summary. Development in the Boise planning area is being directed to the Northwest and Southeast subareas. Although areas of concern (i.e., foothills, floodplains, airport influence areas, etc.) have been addressed in the Boise Policy Plan, implementation of the policy guidelines is uncertain. If the development policies are not strictly followed, the emerging pattern of development could be quite different from that described in this section.

Southwest Planning Area

In response to anticipated adverse impacts associated with rapid development in the Southwest planning area, the Southwest Community Comprehensive Plan study was initiated. This planning effort was designed to determine a development density which would ensure a balanced approach to growth accommodation. Development of a comprehensive plan has proceeded concurrently with the Southwest community wastewater management study (APA 1980). Initially, these planning activities considered two basic development patterns for the Southwest area. The total acreage developed would have been similar under the two scenarios, but would involve different residential densities. These two alternative development patterns were termed the "sewer option" and the "urban reserve option".

Under the "sewer option", the northern 5,700 acres of the Southwest area would be served by the phased construction of a new central sewerage system. In general, density allowances in the northern portion of the area from 1980-1990 would be two units per acre; this would increase to four units per acre from 1990-2000. The southern portion of the Southwest area would continue to grow during the 20-year period at 1 unit per 5 acres. The population projected in 2000 under the "sewer option" was 29,380.

Under the "urban reserve option" development would be guided by land use and wastewater management policies as defined in the Southwest Interim Development District Ordinances and the Southwest Community Comprehensive Plan. In general, these policies would allow development to occur at a maximum of 2 units per acre in the area designated as residential. One unit per 5 acres would be the maximum allowed density in the area designated as "rural residential". This density level would allow a population of 22,400 in the year 2000.

As previously discussed, a comprehensive plan was recently adopted which permits a maximum of 1 unit per 5 acres for new development in the Southwest. This land use plan, referred to as Plan "C" - rural lifestyle, would essentially maintain the existing rural lifestyle which characterizes much of the area. Future development at higher densities, however, was not precluded by adoption of the comprehensive plan. Provisions to resubdivide into higher densities could be implemented at some future date, if coupled with sewer service and other public services. In the meantime, the 5-acre minimum lot size requirement can be expected to significantly reduce new development in the Southwest area (APA 1980).

Based on current population projections for the Southwest area in the year 2000 (18,985 persons [APA 1980]), the growth increase over the 21-year period from 1979-2000 is 4,985 persons. Although this projected population increase is relatively small, the impact on land use could be significant since development densities are limited to 1 unit per 5 acres. Assuming a density of 3 persons per dwelling unit, the projected increase of 4,985 persons from 1979-2000 would result in 1,661 new residences. At 1 unit per 5 acres, at least 8,308 acres would be required to accommodate the project growth. Total acreage in the Southwest area is approximately 10,500 acres (Blake pers. comm.).

The type of development which will likely occur as a result of the adopted density limitations is "ranchette-type" developments. This will result in a sprawl pattern of development which incurs additional costs to provide most public services. In addition, significant capital investment will be required to extend utility services.

Eagle Planning Area. Much uncertainty exists concerning the future land use conditions in the Eagle planning area. Future land use is described here for three alternative development scenarios. The first alternative assumes a continuation of the present development pattern for a population total at the year 2000 of 10,255 (APA 1978). Under this alternative, development along the Highway 44 corridor between Eagle and Boise would continue to occur. Although most of the development is expected to be clustered within the City of Eagle, much of the remaining development would be distributed along major roads such as Eagle Road, Floating Feather Road, and Beacon Light Road. The residential densities for this alternative are defined in the current Eagle Comprehensive Plan (Eagle Planning and Zoning Commission 1978); these are five units per acre in the core area and three units per acre outside of the core area.

The second alternative development scenario assumes the expansion of Eagle south of the Boise River to include an area currently proposed for development. Assuming an entirely residential development, the year 2000 population is projected to be 13,286. A third development alternative assumes that the area south of Boise River would be developed using approximately 290 acres for residential development and 240 acres for an industrial park. If this development mix of residential and industrial park is approved, a population of approximately 16,000 is projected for the year 2000.

While it is not clear to what extent demographic patterns would be altered if the area south of Boise River is annexed and developed, it appears that population and employment patterns, both for the Eagle planning area and other parts of the county, would be affected.

Summary

In conclusion, determination of the future land use conditions for all three planning areas is highly dependent upon the success in implementing and maintaining development policies. In the Boise planning area, future land use conditions appear somewhat predictable since the development pattern is already limited by the structure of existing development. The land use outlook for the Southwest planning area depends on the county's ability to implement the provisions of the Southwest community plan. The future land use pattern in the Eagle planning area envisioned in Eagle's recently adopted general plan may be greatly modified as a result of expansion south of Boise River; the nature of this change cannot be determined until development proposals for the area are finalized.

Chapter 7

AIR QUALITY

Introduction

Terminology

Any discussion of air pollution issues requires an understanding of terms and phrases which have a technical meaning in the context of air pollution discussions. It is especially important to understand the distinction between air pollutant emissions and ambient air quality. The term "pollutant emissions" refers to the amount (usually stated as a weight) of one or more specific compounds introduced into the atmosphere by a given source or group of sources. The term "ambient air quality" refers to the atmospheric concentration (amount in a specified volume of air) of a specific compound actually experienced at a particular geographic location (which may be well removed from the location of relevant emission sources). Measured ambient air quality levels are determined by: the location of emission sources; the types and amounts of pollutants emitted; the physical processes (meteorology) affecting the distribution, dilution, and removal of these pollutants from the area of concern; and chemical reactions which transform pollutant emissions into other chemical substances and sometimes generate other pollutants from normal atmospheric constituents.

Air pollutants are often characterized as being "primary" or "secondary" pollutants. Primary pollutants are those which are emitted directly into the atmosphere (e.g., carbon monoxide, nitric oxide, hydrogen sulfide, sulfur dioxide, many types of particulates, and many types of organic compounds, etc). Secondary pollutants are those which are formed through chemical reactions in the atmosphere (e.g., ozone, nitrogen dioxide, sulfuric acid, sulfate and nitrate particulates, etc.). These chemical reactions usually involve primary pollutants, normal constituents of the atmosphere, and sometimes other secondary pollutants.

The distinction between primary and secondary pollutants is more than a matter of semantics; important air quality management implications are also involved. The ambient concentration of primary pollutants depends on the concentration and strength of emission sources, and the degree to which emissions are dispersed or removed from the atmosphere between the emission source and the ambient air quality monitoring instrument. Thus, air quality problems involving primary pollutants can usually be traced to a single pollutant source (or concentrated group of sources) emitting large quantities of the pollutant of concern. When an air quality problem involves a secondary pollutant, however, the relationship of emission sources to air quality problems becomes much more complicated. Because secondary pollutants are not emitted directly into the atmosphere, observed ambient concentrations may not show much correlation with the concentration of precursor emission sources. The time factor involved in the chemical reactions producing secondary pollutants allows emissions from numerous sources to become dispersed and mixed together. As a result, the observed ambient pollutant concentrations are due more to the cumulative areawide mass emissions of precursors than to the spatial concentration of emission sources.

Meteorological Factors

Meteorological factors are important to consider from several perspectives when evaluating air quality issues. Factors such as temperature, humidity, and the intensity and duration of sunlight play important roles in governing the nature and rate of chemical reactions in the atmosphere. Atmospheric turbulence, wind patterns and vertical temperature gradients are important factors governing the distribution and dispersion of pollutants. Atmospheric turbulence, wind patterns and precipitation processes affect the rate at which pollutants are removed from the atmosphere.

Topographic Effects. Topographic conditions exert considerable influence over local meteorological conditions. Surface winds are deflected and channeled by terrain features, resulting in air flow patterns at ground level which may be quite different from the prevailing winds at higher altitudes. In areas of rugged terrain, slope and exposure greatly influence microclimatic conditions. In such areas, daytime heating of mountain slopes can lead to a gentle upslope breeze. Conversely, nighttime radiational cooling of the slope will produce a layer of cold air next to the ground, resulting in a downslope drainage flow of cold air. These localized upslope and downslope flows are sometimes called mountain and valley winds.

Atmospheric Stability and Temperature Inversions. The topic of atmospheric stability centers on processes which produce or resist vertical motions in the atmosphere. On a microscale level, vertical motions are predominantly a result of mechanical turbulence due to wind flow across non-uniform surface features. On a larger scale, vertical temperature differences within an air column become the major consideration. Because atmospheric pressure decreases with altitude, there is also a natural tendency in the lower atmosphere for temperature to decrease with altitude.

An air parcel can be heated by contact with a warmer surface, absorption of sunlight or infrared radiation, or through heat released by condensation of liquids within the air mass. If the air near ground level is heated sufficiently, a pocket or "cell" of warmed air will expand and rise, being displaced by cooler, denser air from above. As it rises, the cell of warm air will expand further due to decreasing atmospheric pressure, causing the temperature of the air cell to drop. The air cell will continue to rise, expand in volume, and cool until it reaches an altitude where it is at the same temperature and pressure as surrounding air masses. This rising of warmed air and replacement of cooler air from above results in vertical mixing of the air column. This type of vertical instability occurs when air at ground level is significantly warmer than the air aloft. If the air at ground level is only a little warmer than the air aloft, air parcels will neither rise nor sink, and "neutral stability" conditions will exist.

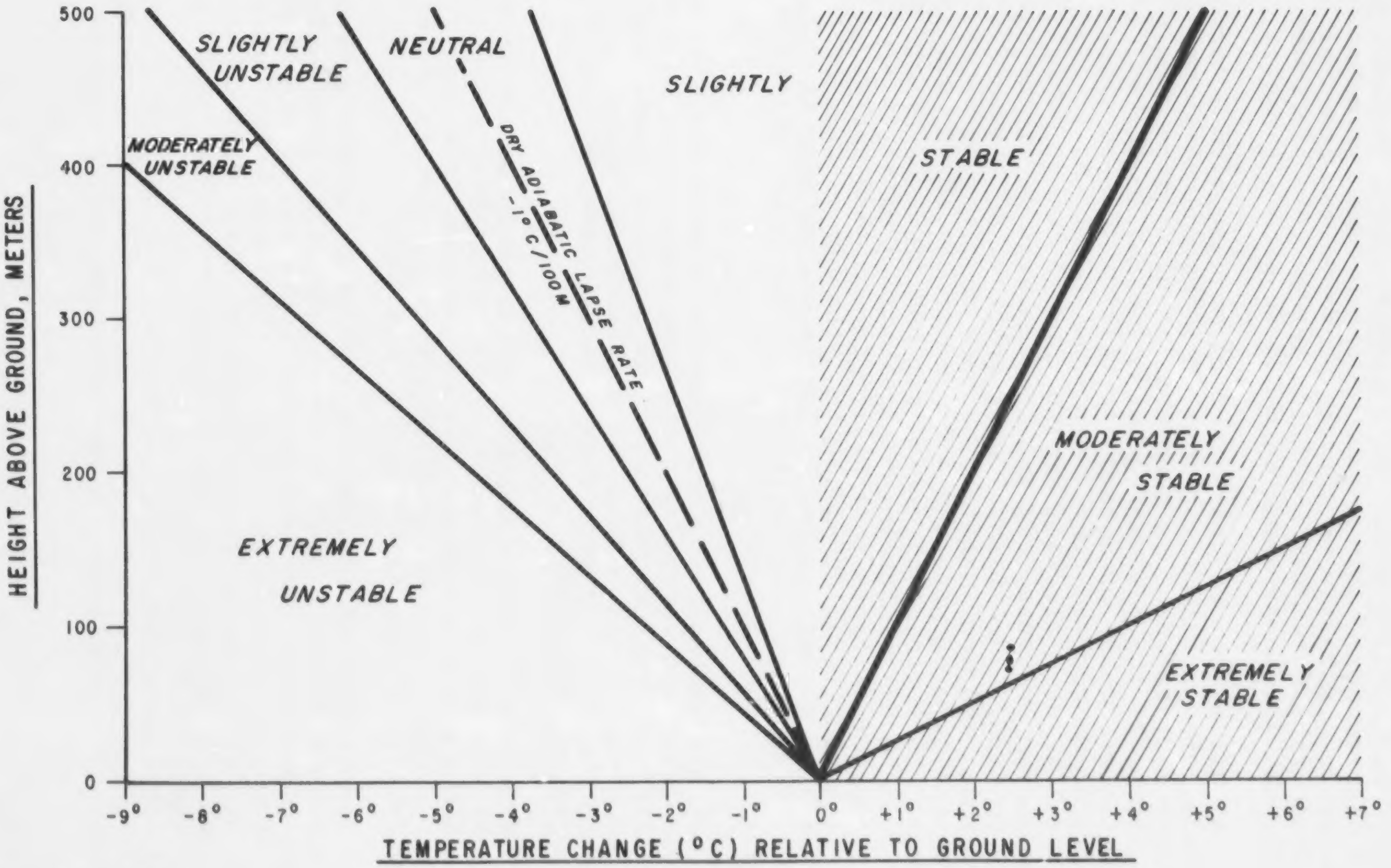
Stable atmospheric conditions occur when the air near ground level has essentially the same temperature as the air aloft, or when the air aloft is actually warmer than the air at ground level. This latter situation, where air temperature actually increases with altitude, is called a temperature inversion.

Figure 7-1 illustrates the relationship between vertical temperature changes and the various atmospheric stability conditions discussed above. As can be seen from this figure, unstable conditions are more sensitive to changes in vertical temperature gradients than are stable conditions.

Temperature inversions can form under a wide variety of circumstances. Radiation inversions often form during clear nights when the land surface cools faster than the air above it. Air at ground level thus cools more rapidly than air at higher altitudes, creating a temperature inversion. In mountainous areas, downslope movements of dense, cold air from higher elevations can create an inversion condition in valley areas. An influx of a shallow layer of cold air under a larger warm air mass will also create an inversion condition. A warm air mass moving into an area

FIGURE 7-1

RELATIONSHIP BETWEEN ATMOSPHERIC STABILITY AND INVERSION CONDITIONS



-LEGEND-

▨ INVERSION CONDITIONS

Source: Jones & Stokes Associates, Inc.

NOTES:

- DIVISIONS BETWEEN STABILITY CATEGORIES ARE SHOWN MORE FOR SCHEMATIC PURPOSES THAN FOR PRECISE GUIDELINES.
- CHANGE OF 1°C. = CHANGE OF 1.8° F.
- 100 METERS = 328 FEET

above a cold air mass at ground level can also create inversion conditions. A subsidence inversion forms when a large mass of air within a stagnant high pressure system sinks down over an area and is warmed by compression to a temperature higher than that of the surface air mass. This occurs because, as air from the center of a high pressure area spreads outward, it is replaced by a sinking air mass from above.

Radiation inversions and inversions formed by cold air drainage usually occur at or near ground level. Subsidence inversions usually form at higher altitudes above the ground. Both surface and elevated inversion layers may be present simultaneously. Surface inversions tend to break with normal daytime heating of the land while inversions aloft tend to be more persistent.

It should also be noted that cloud cover reduces daytime heating of the ground and traps nighttime heat radiation from the ground, thus favoring neutral stability conditions. Strong winds result in turbulent mixing of the lower atmosphere, thus suppressing both the heating and cooling of surface air parcels; this again promotes neutral stability conditions (though adding mechanical turbulence).

The presence of snow cover or frozen ground conditions can greatly influence the persistence of ground level inversions. Snow cover reflects sunlight, resulting in reduced heating of land surfaces. Frozen ground will absorb sunlight and warm when temperatures are below freezing. As the ground temperature approaches 32°F, the heat energy in sunlight will be expended in thawing the soil with little actual change in soil temperature. Thus, both snow cover and frozen ground conditions can inhibit the processes which weaken and destroy ground level inversions.

Existing Air Quality Problems

Ambient air quality monitoring in the Boise area has focused on carbon monoxide (CO). The Idaho Air Quality Bureau operates two permanent CO monitoring stations which provide continuous monitoring data. The Idaho Transportation Department operates a third continuous monitoring station at its State Street offices. There have also been three special CO monitoring programs which provide additional data on the nature and extent of CO problems. There has been a limited amount of monitoring for other pollutants. Since data are limited for other pollutants, the focus of this chapter will be on CO.

EPA has established two sets of ambient air quality standards for CO. The standard for 1-hour exposures is currently 35 ppm (parts per million), to be exceeded no more than once per year at any air quality monitoring site. An additional standard has been set for 8-hour exposures. This standard (9 ppm averaged over a consecutive 8-hour period) is also to be exceeded no more than once per year. In practice, the 8-hour standard is more stringent than the current 1-hour standard. EPA has proposed changing the 1-hour standard to 25 ppm, but no final action has yet been taken.

Summary

Available monitoring data from several sources indicate that the Boise area experiences a geographically extensive pattern of high CO levels. These high CO levels are concentrated primarily along major traffic corridors. Under appropriate meteorological conditions (light winds and low level temperature inversions), air masses containing high CO levels can be transported more or less intact over distances of up to 1 mile. Thus, much of the Boise area is susceptible to episodes of high CO levels which originate primarily from major roadway corridors.

Episodes of high CO levels show a rather strong seasonal pattern, with most episodes occurring during the winter (November-February). There have, however, been instances of 8-hour CO levels above the federal standard during every month of the year and almost every possible 8-hour period of the day. The seasonality, frequency, and magnitude of CO episodes show significant yearly variation.

The valley and bench areas in Boise both experience severe CO episodes. The hourly patterns of high CO episodes in these two areas are rather distinctive. While these patterns could be produced in several ways, the simplest explanation centers around differences in the pattern of vehicle activity. Vehicle emissions are clearly the source of CO problems in the Boise area. The frequency and magnitude of CO episodes, however, are strongly influenced by the meteorological and topographic conditions of the area.

Appendix G provides a discussion of CO data collected by the various special studies and the permanent monitoring stations. These various data sources are briefly discussed below.

ESL/CH2M Hill Study

The first significant air quality monitoring program in the Boise area was conducted from January through May 1974. Monitoring site locations are shown in Figure 7-2. In addition to these monitoring stations, short-term bag sampling was conducted at street intersections near four of the five fixed stations. The federal 8-hour CO standard was exceeded at three of the five sites. The Eastman Building site regularly recorded monthly peak 8-hour average CO values of 12-20 ppm. None of the short-term bag sampling identified any violation of the federal 1-hour standard.

This study concluded that CO problems existed in the downtown Boise area, and at some more outlying areas. It was also concluded that areas on the first bench or higher locations generally comply with the federal CO standards.

EPA Study

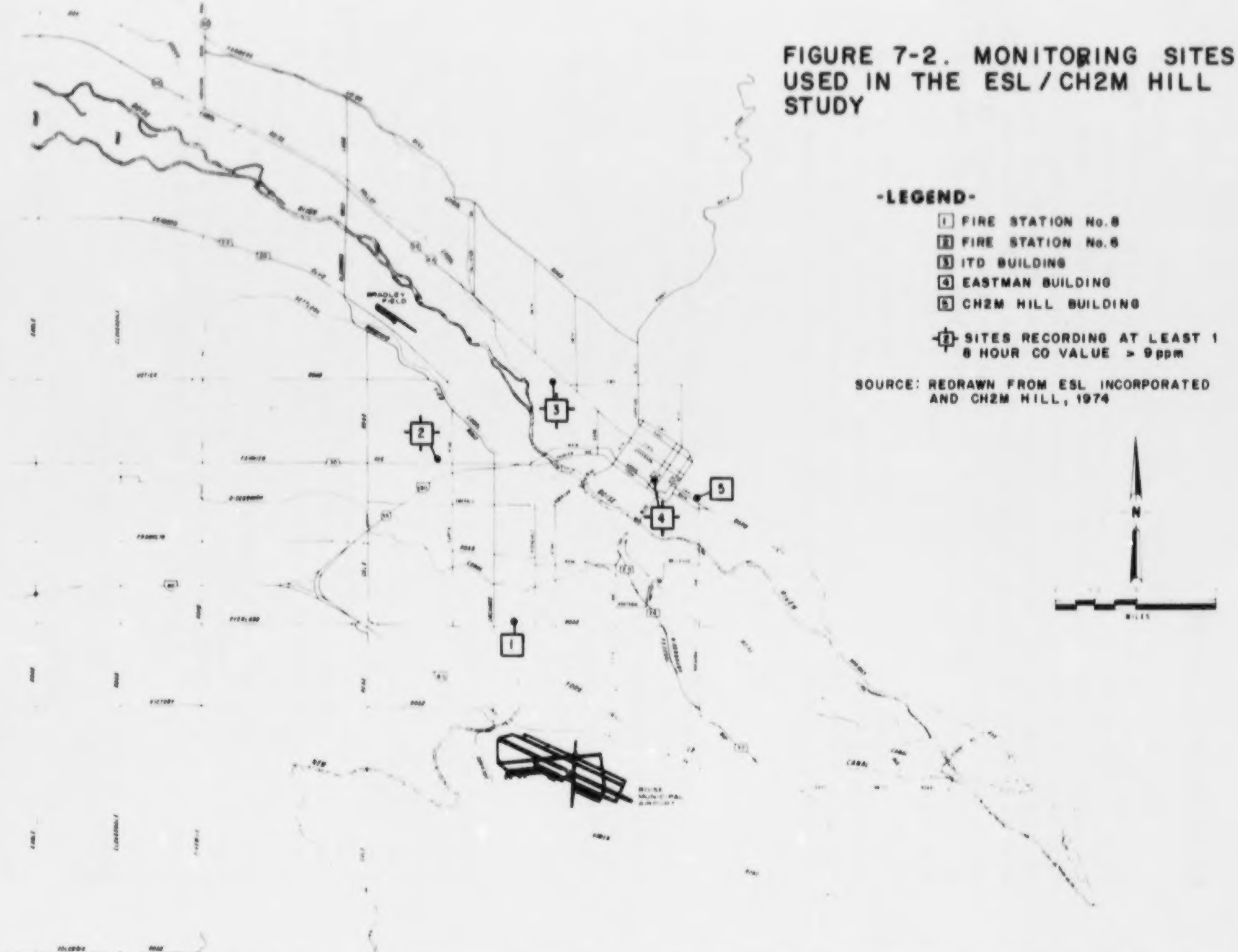
EPA sponsored a special CO monitoring study during late 1977. Four-hour bag samples were collected twice a day on weekdays between 10:00 a.m. and 6:00 p.m. Monitoring sites used in this study are shown in Figure 7-3. Site 13 was located adjacent to the Idaho Air Quality Bureau's downtown monitoring station. The peak 8-hour CO level measured during this study was 17.2 ppm at site 32.

This study concluded that the state's permanent monitoring station on Ninth Street is generally representative of CO concentrations in downtown Boise, although the station underestimated the magnitude and frequency of elevated CO levels. For example, the permanent station recorded exceedences of the federal 8-hour CO standard on 47 percent of the study days. This is in contrast to one or more of the study sites recording exceedences on 95 percent of the days. The state's downtown monitoring station recorded an 8-hour CO level of 13.7 ppm at the time that EPA's site 32 station recorded the 17.2 ppm average noted above. On 19 of the 20 days in the study at least one of the EPA study sites had a 10:00 a.m. to 6:00 p.m. average CO level greater than the simultaneous reading at the state's Ninth Street monitoring station.

Idaho Air Quality Bureau Study

In an attempt to better characterize the spatial extent of the carbon monoxide problem in Boise, the Idaho Air Quality Bureau conducted a special monitoring program between November 7, 1977 and March 6, 1978. The major purpose of the study was to assess carbon monoxide levels in areas outside the central business district of Boise. The bench areas southwest of

FIGURE 7-2. MONITORING SITES USED IN THE ESL / CH2M HILL STUDY


-LEGEND-
1 FIRE STATION No. 8
2 FIRE STATION No. 6
3 ITD BUILDING
4 EASTMAN BUILDING
5 CH2M HILL BUILDING
SITES RECORDING AT LEAST 1 8 HOUR CO VALUE > 9 ppm
BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
MILES
1
2
3
4
5

SOURCE: REDRAWN FROM ESL INCORPORATED AND CH2M HILL, 1974

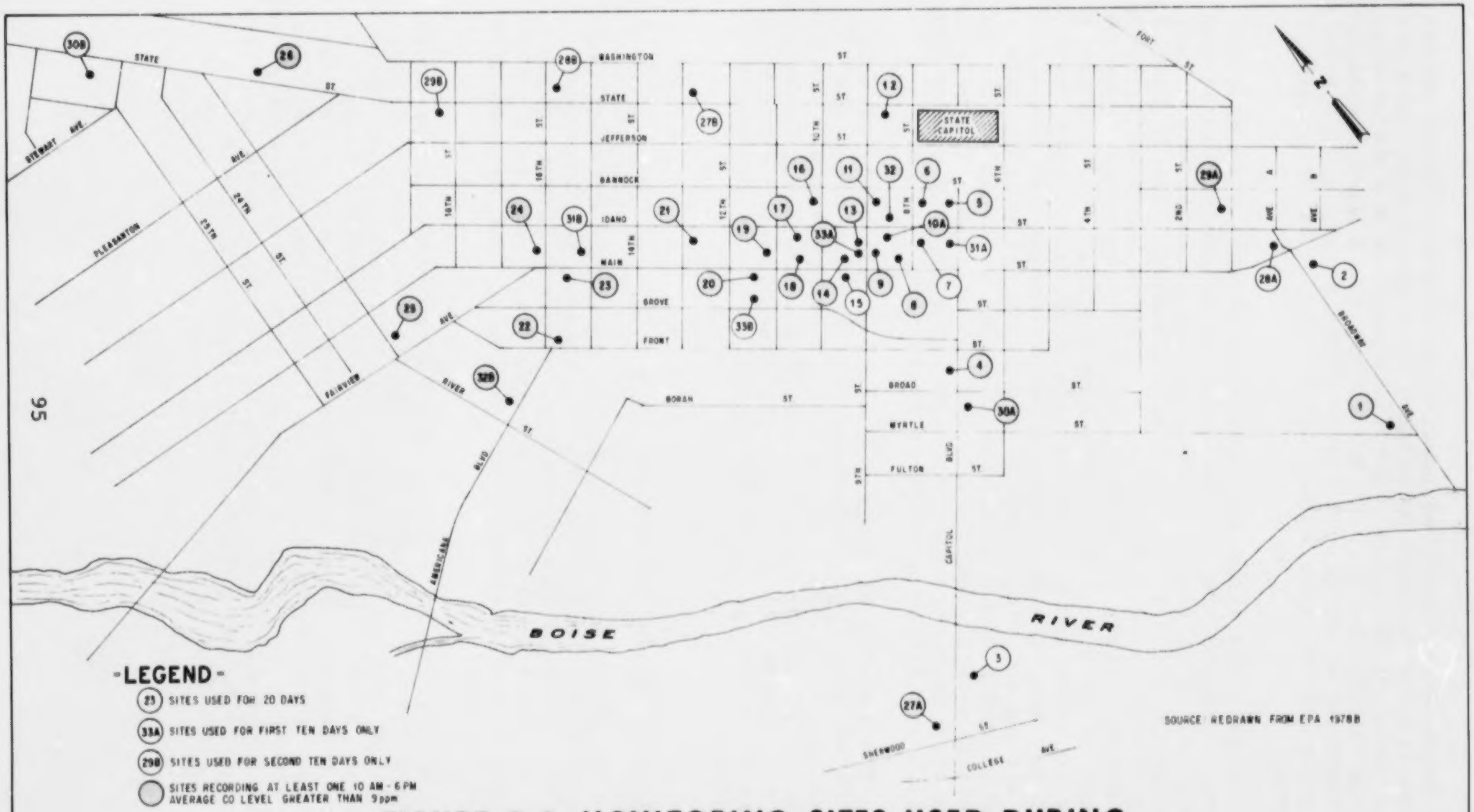

N
STATE CAPITOL
FORT ST
WASHINGTON
STATE
JEFFERSON
BANNOCK
IDAHO
MAIN
GROVE
FRONT
BROAD
MYRTLE
FULTON
BORAH ST
RIVER ST
AMERICANA BLVD
CAPITOL BLVD
BROADWAY AVE
FAIRVIEW
PLEASANTON AVE
STEWART AVE
24TH ST
25TH ST
16TH ST
13TH ST
12TH ST
10TH ST
9TH ST
8TH ST
6TH ST
4TH ST
2ND ST
AVE A
AVE B
SHERWOOD ST
COLLEGE AVE
BOISE RIVER
30B
26
29B
28B
27B
12
24
31B
21
19
17
16
11
32
6
5
13
33A
10A
31A
7
8
9
15
14
18
20
33B
23
22
25
32B
4
30A
29A
28A
2
1
3
27A
SOURCE: REDRAWN FROM EPA 1978B
-LEGEND-
23 SITES USED FOR 20 DAYS
33A SITES USED FOR FIRST TEN DAYS ONLY
29B SITES USED FOR SECOND TEN DAYS ONLY
SITES RECORDING AT LEAST ONE 10 AM - 6 PM AVERAGE CO LEVEL GREATER THAN 9ppm

FIGURE 7-3. MONITORING SITES USED DURING THE EPA CARBON MONOXIDE STUDY

the Boise River received special attention. Three portable CO monitors were used to collect data for 1-week time periods at a total of 46 sites. Traffic counts were made at most of the monitoring sites. Monitoring sites were classified by location as either valley or bench sites, and by proximity to major roadways as either traffic corridor or neighborhood sites.

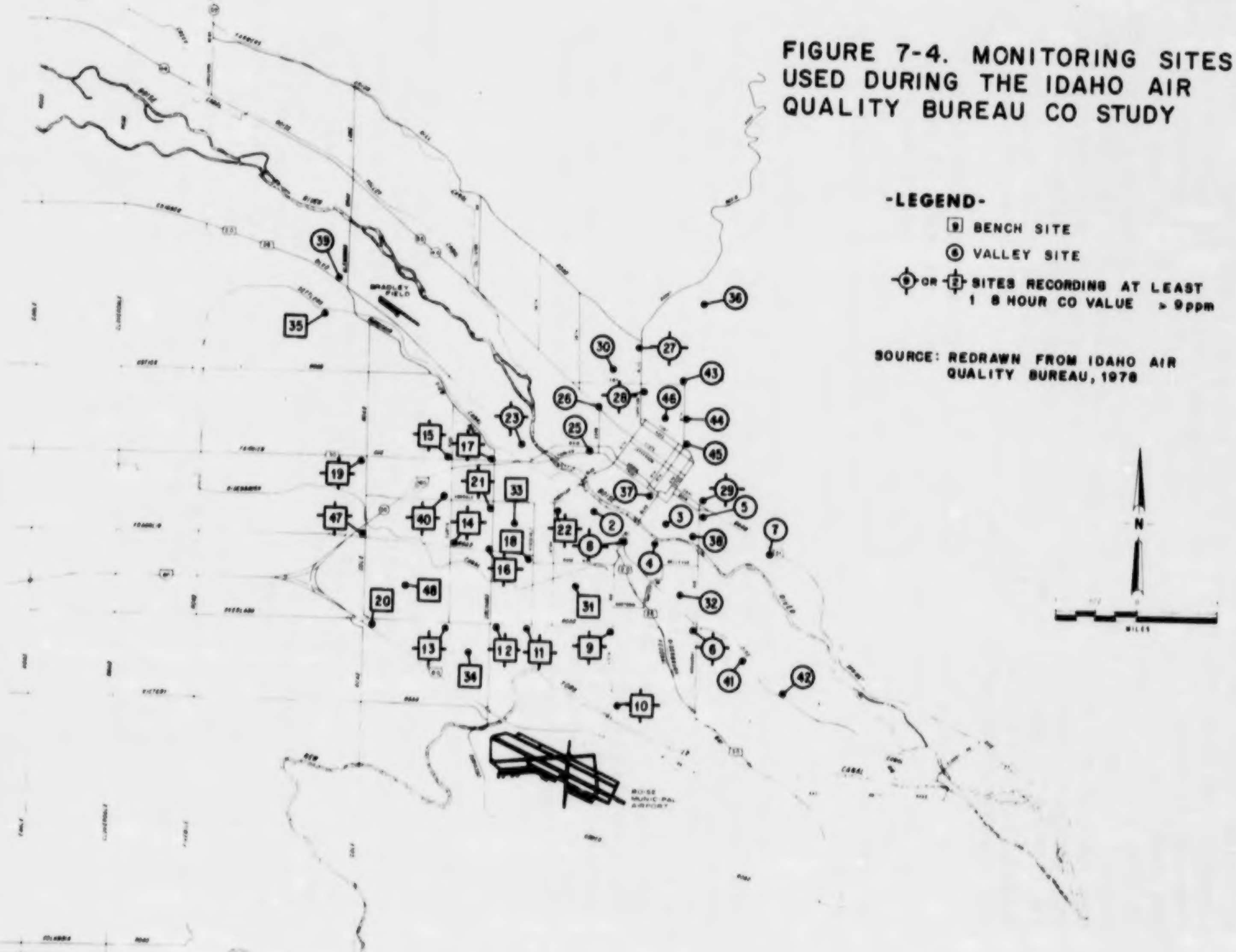
Figure 7-4 shows the locations of the 46 monitoring sites. Despite the limited duration of monitoring at any one site, 20 of the 46 sites recorded at least one 8-hour average CO value above the 9 ppm standard. The highest 8-hour CO values were monitored at traffic corridor sites on the bench. Eight of 10 stations reporting peak 8-hour CO values of 12 ppm or more were bench sites. The highest 8-hour CO value recorded during the study (25.0 ppm) occurred on a day when the permanent downtown monitoring station did not record any violations of the 8-hour standard. This value also exceeded the peak 8-hour CO value recorded by the Ninth Street monitoring station during all of 1978. The only neighborhood site to record an 8-hour CO value above 9 ppm recorded an 11.1 ppm 8-hour average at this time.

The results of the Air Quality Bureau study clearly indicated that high CO levels occurred near major traffic arteries on the bench as well as in valley areas. The results also confirmed the observations of the EPA study regarding the occurrence of high CO levels even when the Ninth Street monitoring station shows no violation of the federal 8-hour standard.

Permanent Monitoring Station Data

The Idaho Air Quality Bureau currently operates two permanent monitoring stations in Boise. The downtown station (at the Odd Fellows Hall on Ninth Street, southwest of Idaho Street) has operated since July 1975. The Orchard Street station (south of Highway 55) has operated since May 1978.

Monitoring data from these two stations are presented in Appendix G. The downtown station has recorded 8-hour CO values as high as 20.4 ppm (in 1978) and 1-hour CO values as high as 40.9 ppm (1977). Violations of the federal 8-hour CO standard have been recorded on as many as 87 days during a single year (1976) at the downtown station. Peak CO values at the Orchard site are much lower (8-hour average of 12.8 ppm and 1-hour average of 29.5 ppm, both in 1979). Complete data for 1980 have not yet been reviewed.



BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
MILES
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35
36
30
27
43
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28
46
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42
10

FIGURE 7-4. MONITORING SITES USED DURING THE IDAHO AIR QUALITY BUREAU CO STUDY

-LEGEND-

9 BENCH SITE

6 VALLEY SITE

⊕ OR ⊞ SITES RECORDING AT LEAST 1 8 HOUR CO VALUE > 9ppm

SOURCE: REDRAWN FROM IDAHO AIR QUALITY BUREAU, 1978

The hourly pattern of CO levels in the downtown area is illustrated by Figure 7-5. Both the morning and evening commute periods are evident from the monitoring data. The evening commute period shows a higher average CO value than the morning commute period. This is partially a reflection of the station location (near the intersection of two "outbound" streets). A more significant factor, however, involves the operating condition of cars in the location traffic flows. The evening commute period involves cars which are generally in a "cold" operating mode (with high emission rates). A significant portion of the morning commute traffic will be in a warmed-up operating mode (with lower emission rates).

An interesting contrast to the downtown station is provided by the Orchard Street station. The pattern of hourly CO levels at this site (Figure 7-6) shows a predominance of the morning commute pattern. A major factor here, as at the downtown site, is the cold vs. warmed-up condition of vehicles in the local traffic flow.

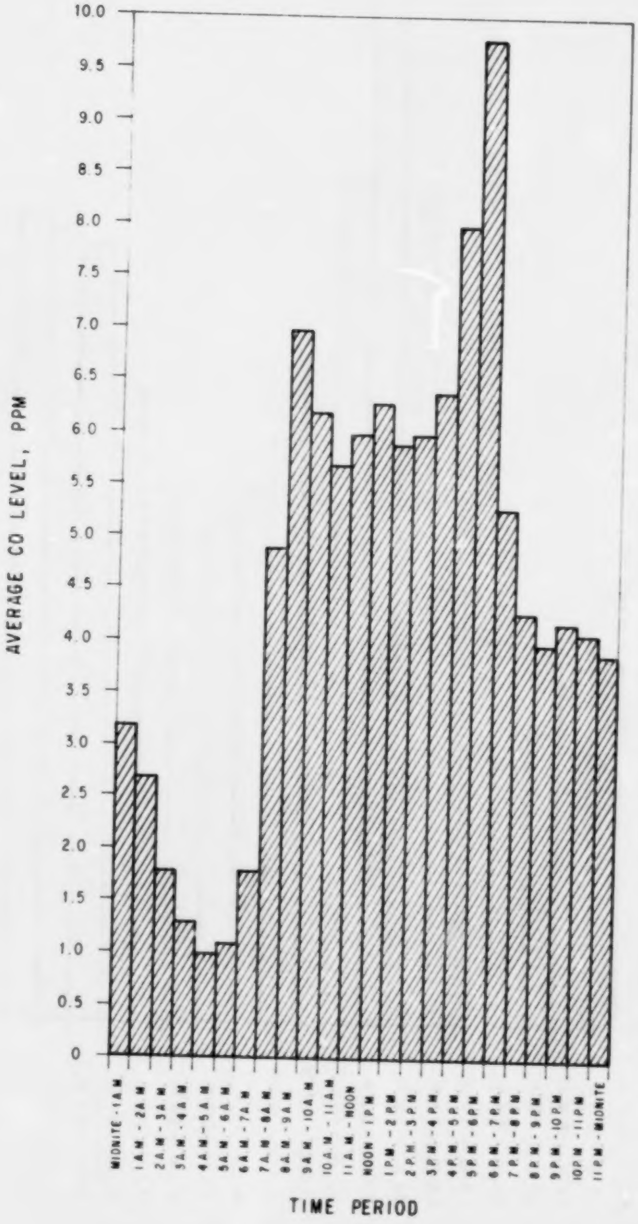
The downtown and Orchard monitoring stations show distinctive patterns in the occurrence of 8-hour CO values exceeding the 9 ppm standard. Data from the downtown station are summarized in Figure 7-7. Most episodes occur during time periods which include the mid-afternoon and early evening periods. The Orchard site (Figure 7-8) shows a pattern which has two distinct periods of episode conditions. High CO levels tend to occur during the morning to early afternoon period and again during the evening to late nighttime period. To a large extent, this is probably a reflection of shopping and other nonwork trips.

Idaho Transportation Department Monitoring Data

The Idaho Transportation Department operates a continuous CO monitor at its laboratory building off of State Street. Data have been collected since December 1975. No statistical data summaries are available. A preliminary review of the hourly data indicate five episodes of 8-hour CO levels above the federal standard (1 in 1976 and 4 in 1979). The highest 8-hour CO value appears to be a 10.6 ppm average on November 16, 1979 (7:00 a.m. to 3:00 p.m.). All of these episodes occurred during the early morning to early afternoon time period. The highest 1-hour CO level reported was 30 ppm on February 17, 1976 at 8:00 a.m. to 9:00 a.m. The pattern of hourly CO levels strongly suggests the influence of local vehicle parking activities plus some pollutant transport from other areas.

FIGURE 7-5

AVERAGE WINTER CARBON MONOXIDE LEVELS
AT THE BOISE ODD FELLOWS HALL
MONITORING STATION

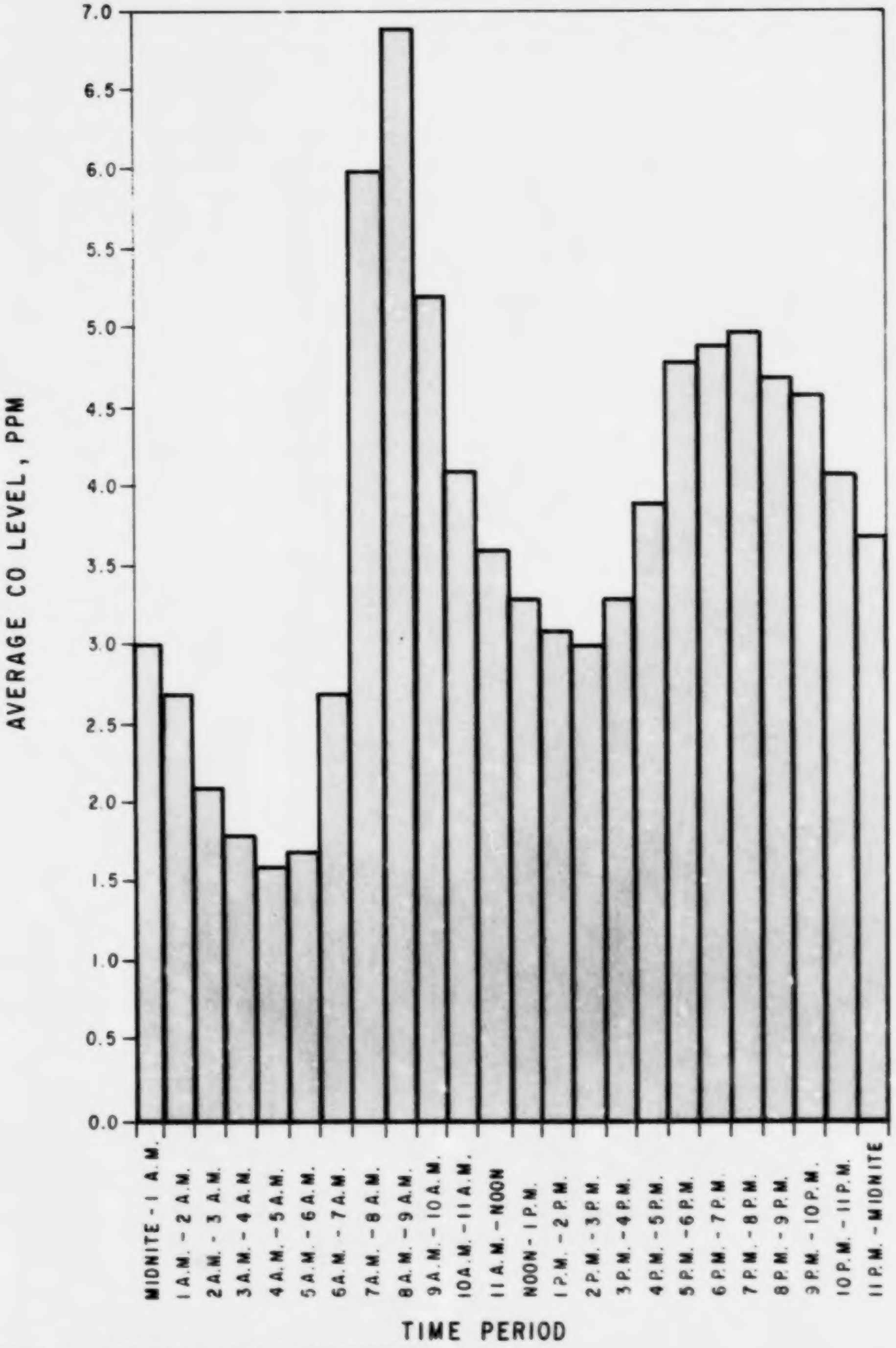


NOTE: BASED ON OCTOBER THROUGH FEBRUARY DATA.

DATA SOURCE: OCTOBER 1975 - FEBRUARY 1980 HOURLY
CO DATA FROM IDAHO AIR QUALITY
BUREAU.

FIGURE 7-6

AVERAGE WINTER CARBON MONOXIDE LEVELS AT THE CENTRAL DISTRICT HEALTH DEPARTMENT MONITORING STATION

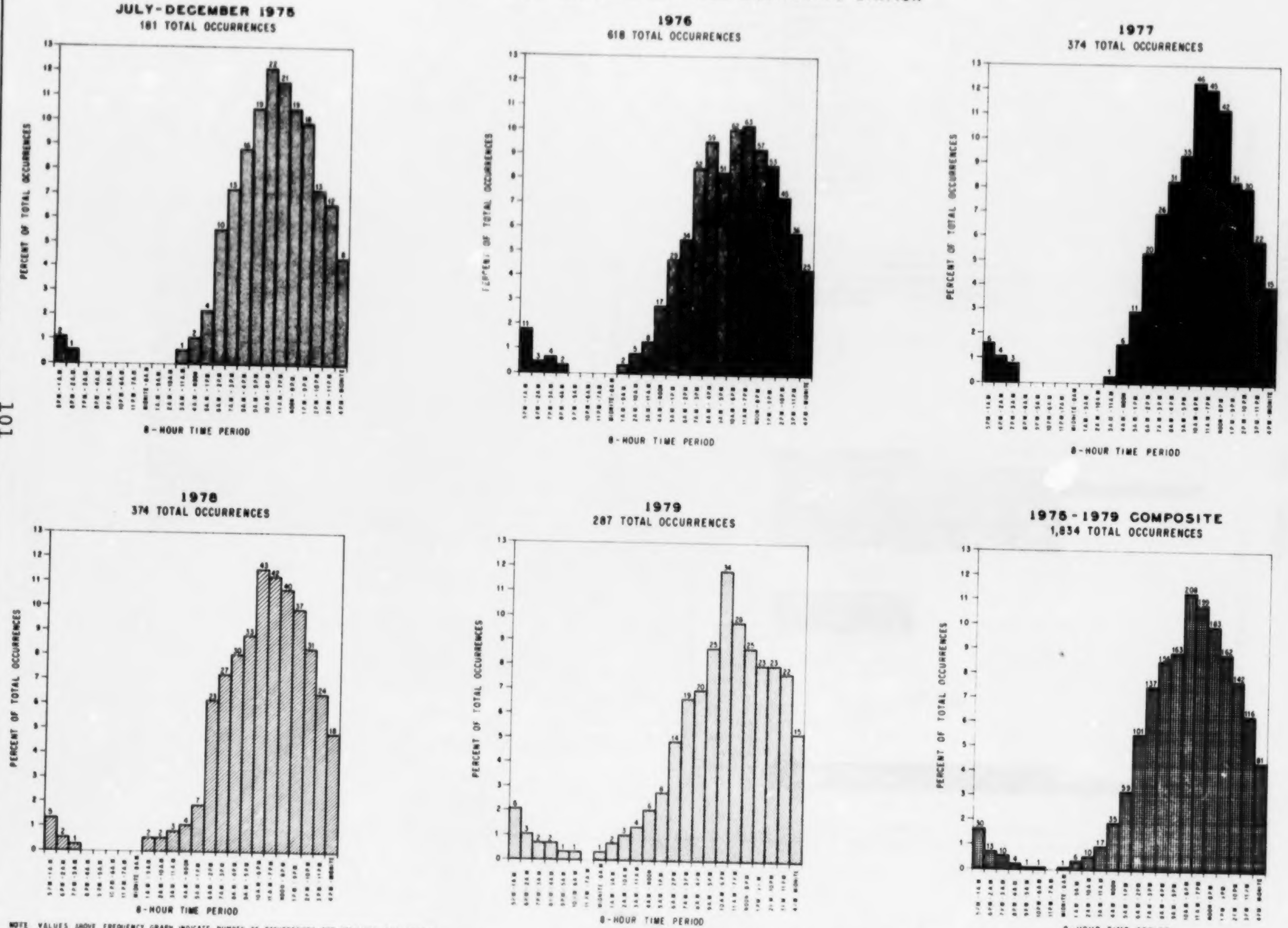


NOTE: BASED ON OCTOBER THROUGH FEBRUARY DATA.

DATA SOURCE: OCTOBER 1978 - FEBRUARY 1980 HOURLY CO DATA
FROM IDAHO AIR QUALITY BUREAU.

FIGURE 7-7

TIME PERIODS WITH 8-HOUR CO LEVELS > 9.0 PPM
AT THE BOISE ODD FELLOWS HALL MONITORING STATION



NOTE: VALUES ABOVE FREQUENCY GRAPH INDICATE NUMBER OF OCCURRENCES FOR SPECIFIED TIME PERIOD

DATA SOURCE: HOURLY CO DATA FROM IDAHO AIR QUALITY BUREAU

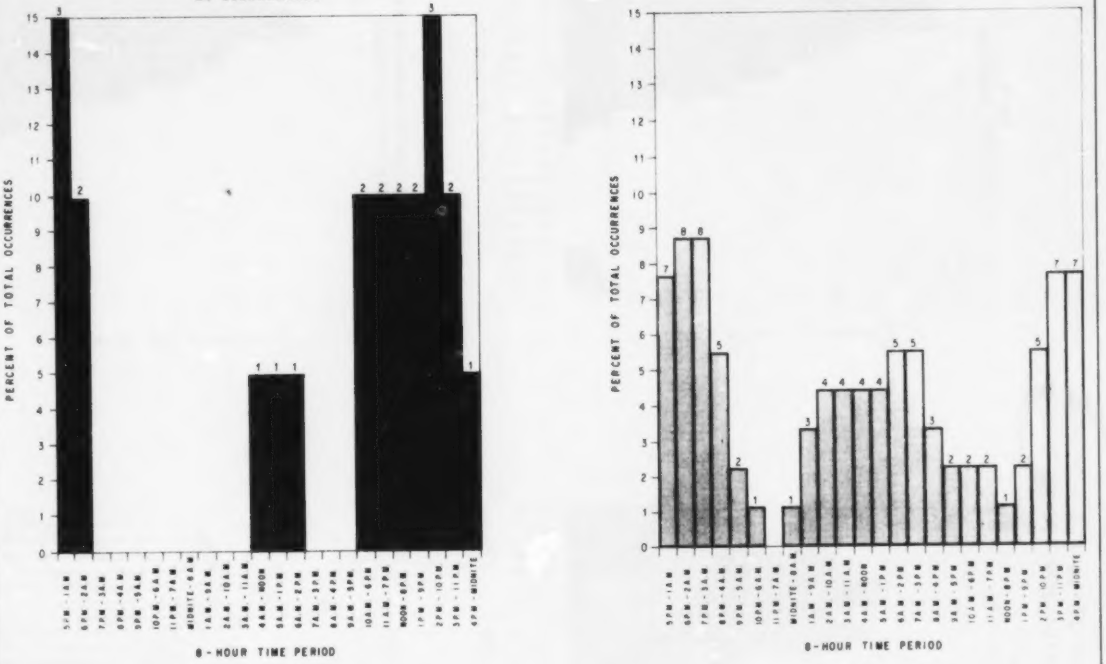
FIGURE 7-8
TIME PERIODS WITH 8-HOUR CO LEVELS >9.0 PPM AT CENTRAL DISTRICT HEALTH DEPARTMENT MONITORING STATION

MAY-DECEMBER 1978

20 OCCURRENCES

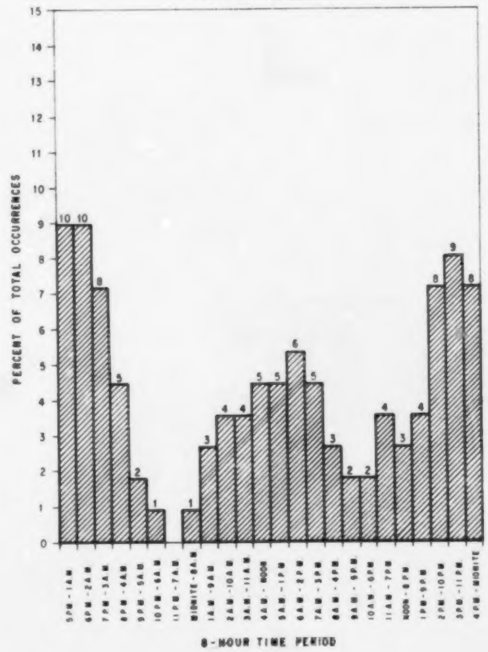
1979

92 OCCURRENCES



1978-1979 COMPOSITE

112 OCCURRENCES



NOTE: VALUES ABOVE FREQUENCY GRAPH INDICATE NUMBER OF OCCURRENCES FOR SPECIFIED TIME PERIOD.

DATA SOURCE: HOURLY CO DATA FROM IDAHO AIR QUALITY BUREAU

Air Quality Management Considerations

Institutional Framework

Federal and state activities related to air quality have been authorized by several pieces of legislation, the most important of which are the 1970 and 1977 amendments to the Clean Air Act. The 1970 Clean Air Act amendments set the basic structure for federal and state air pollution control programs. This basic structure has been retained under the 1977 Clean Air Act amendments.

The 1970 Clean Air Act amendments required each state to develop and adopt a plan (implementation plan) to achieve, maintain and enforce the national primary and secondary ambient air quality standards in all portions of the state. The 1970 amendments further required that these implementation plans provide the means for achieving and maintaining all national primary standards by July 1975 and all national secondary standards "within a reasonable time". EPA was granted the authority to approve or disapprove these plans, and to promulgate an acceptable plan if all or a portion of the submitted plan was disapproved. EPA was also given the authority to grant time extensions of up to 2 years for the attainment of a national primary ambient air quality standard in any particular air quality control region.

The 1977 Clean Air Act amendments recognized the fact that most of the major urban regions of the country failed to attain the national primary air quality standards within the deadlines set by the 1970 Clean Air Act amendments. The new amendments required the states and EPA to identify areas which meet all federal air quality standards; areas which exceed any of the federal standards; and areas where adequate ambient air quality monitoring data are lacking. Ada County has been designated a "nonattainment area" for carbon monoxide, and as either an "attainment area" or an "unclassifiable area" (areas where data are nonexistent or insufficient to determine attainment or nonattainment status) for other air pollutants.

The 1977 amendments to the Clean Air Act establish numerous criteria for determining the adequacy of state implementation plans. Some of the more significant of these include the following requirements:

- o The implementation plan must include special provisions for areas designated as nonattainment areas. Plans for nonattainment areas must provide a means of achieving the federal primary standards as expeditiously as possible, but not later than December 31, 1982.

- If an area is designated as a nonattainment area with respect to ozone or carbon monoxide, EPA can extend the deadline for achieving the federal air quality standard by up to 5 years (to December 31, 1987) provided a number of specified conditions are met.

- The implementation plan must include schedules and timetables for implementing emission limitations, transportation controls, air quality maintenance plans, preconstruction review of direct sources of pollution, and other measures necessary to ensure attainment and maintenance of the federal primary and secondary air quality standards.

- State implementation plans for nonattainment areas must provide for installation of "reasonably available control technology" on existing stationary sources.

- Plans for nonattainment areas must provide a means of achieving annual incremental reductions in the emissions of relevant pollutants so as to attain the federal air quality standards by the target date identified in the plan ("reasonable further progress" requirement).

- Plans for nonattainment areas must expressly identify and quantify pollutant emissions which will be allowed to result from the construction and operation of major new or modified stationary sources in the nonattainment area.

- The implementation plan must prohibit construction or modification of major stationary sources in nonattainment areas after June 30, 1979 if the state has failed to submit to EPA acceptable implementation plan revisions pertaining to that nonattainment area.

The 1977 Clean Air Act amendments indicate that implementation plan provisions for ozone and carbon monoxide nonattainment areas should be prepared by an appropriate organization of local government officials, as designated by the state. The Ada Planning Association (APA) has been designated as the lead agency for developing air quality management programs for Ada County.

The 1977 Clean Air Act amendments contain several provisions regarding federal permit activities or financial assistance programs. These provisions can be summarized as follows:

- After July 1, 1979 EPA is prohibited from awarding any grants authorized under the Clean Air Act, except for air quality improvement or maintenance purposes, if the agency applying for the grant is in an air quality control region where the following three conditions apply: one or more federal primary standards have not been attained; transportation control measures are necessary to achieve the standard being violated; and an appropriate state implementation plan has not been submitted (or reasonable efforts toward developing such a plan are not being made). This funding prohibition also applies if an approved plan is not being implemented.

- After July 1, 1979 the U. S. Department of Transportation is prohibited from awarding grants of approving projects under Title 23, United States Code, except for safety, mass transit, or transportation projects which improve air quality, if the agency applying for the grant funds or project approval is in an air quality control region where the three conditions cited above apply. This funding prohibition also applies if an approved plan is not being implemented.

- No federal agency can engage in, license, permit, approve, or support in any way any activity which does not conform to the approved or promulgated state implementation plan for the relevant area.

- EPA is authorized to withhold, condition, or restrict any grant for construction of sewage treatment facilities if it is determined that: a) such sewage treatment facilities will not comply with Clean Air Act provisions relating to new source performance standards or emission standards for hazardous air pollutants; b) the state does not have, or is not implementing, an approved state implementation plan which expressly quantifies and provides necessary management programs to deal with the air pollutant emissions which may reasonably be anticipated to result directly or indirectly from the new sewage treatment capacity to be created by such construction; c) the construction of such treatment works would create new sewage treatment capacity which may reasonably be anticipated to cause or contribute to, directly or indirectly, a larger increase in pollutant emissions than has been provided for under the applicable state implementation plan; or d) the construction of such treatment works would create new sewage treatment capacity which would cause or contribute to, directly or indirectly, an increase in pollutant emissions which will interfere with or be inconsistent with the applicable implementation plan of any other state.

Emissions Inventories and Forecasts

CO emissions have been estimated for several groups of emission sources in northern Ada County. The greatest attention has been devoted to sources in the Boise metropolitan area, since air quality monitoring data have documented serious CO problems throughout the Boise area. Emission estimates have been structured to reflect historical conditions for 1977 and 1980, and expected conditions for 1987 and 2000. Three broad categories of emission sources have been evaluated: vehicle traffic on major roadways, on- and off-street vehicle parking activity, and residential fuel combustion for space heating or appliance operation. Commercial and industrial fuel combustion emissions have not been estimated. Data for residential fuel combustion suggest that commercial and industrial sources are probably insignificant. Drive-up window facilities have not been directly evaluated for the emission inventories and forecasts discussed here. Data for parking facilities suggest that drive-up facilities may be significant localized emission sources. Hourly emission inventory and forecast results for the three major source categories are presented in Appendix F.

Procedures used to produce the emission inventories and forecasts are discussed in detail in Appendix A. All forecasts were based primarily on the same population and employment forecasts (APA 1978). Emissions from highway traffic were based on traffic volumes projected by the Boise area traffic model. Parking emissions were developed using a variety of parking surveys from the Boise area. Residential fuel combustion emissions were developed using data from a recent survey of energy usage patterns (Elrick and Lavidge 1980). All emission inventories and forecasts were prepared in a manner allowing results to be summarized by community planning area. The boundaries of community planning areas as used for the Boise area traffic model and the emission forecasting work are shown in Figures 7-9 and 7-10.

Results of the emission inventory and forecast work are summarized in Table 7-1. As is apparent from this table, use of wood stoves and fireplaces results in a significant contribution to total CO emissions in the Boise area. Because CO is a "primary" pollutant (i.e., emitted directly rather than being formed through chemical reactions), the total emissions burden in a regional area is not the best indicator of contributions to ambient pollutant levels. This point is illustrated by using a comparison which accounts for both the quantity of emissions and the acreage of the sources producing those emissions. Such a comparison is shown in Table 7-2.

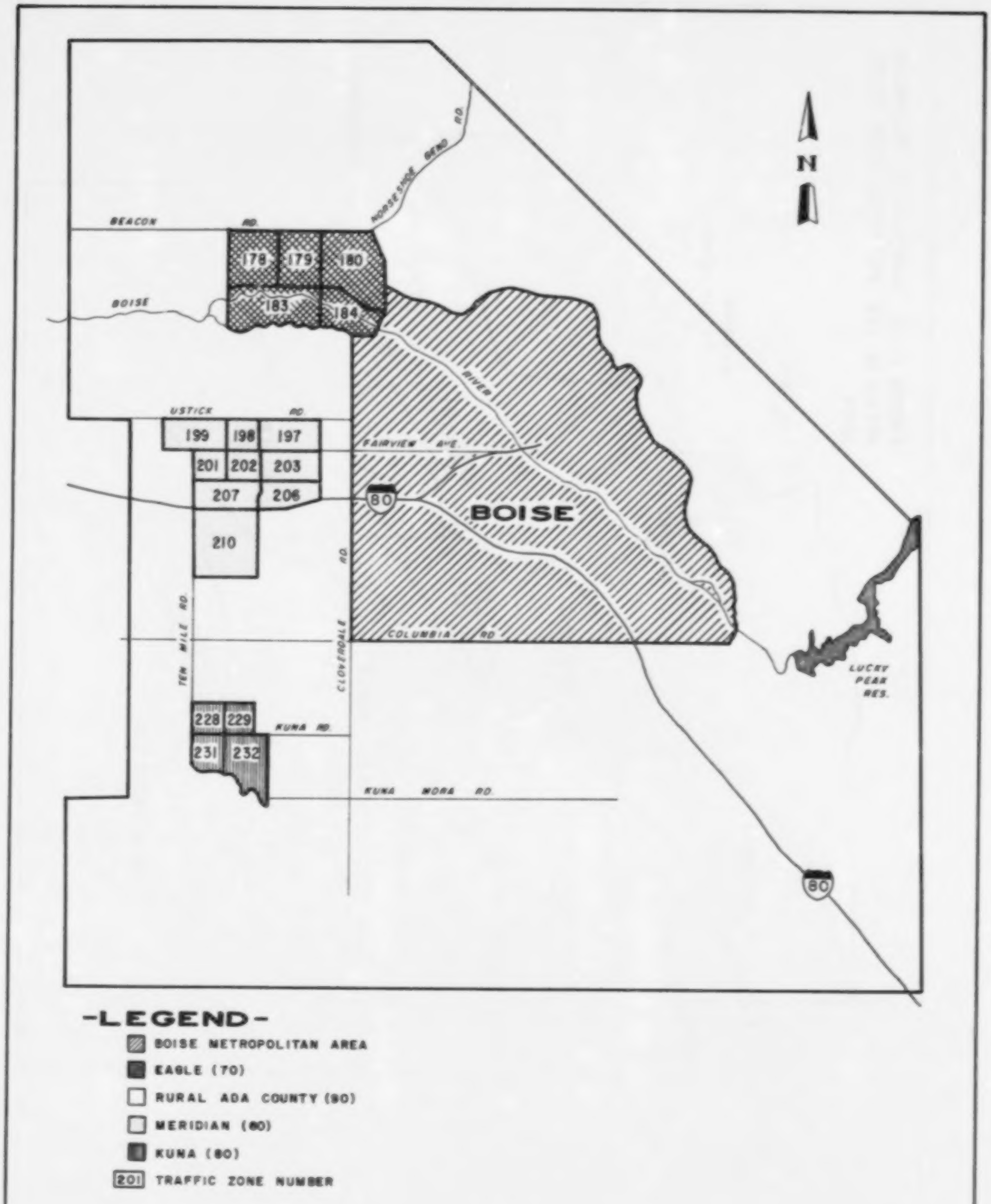

N
BEACON RD.
HORSESHOE BEND RD.
BOISE
RIVER
178
179
180
183
184
USTICK RD.
199
198
197
FAIRVIEW AVE.
201
202
203
207
206
80
BOISE
210
TEN MILE RD.
CLOVERDALE RD.
COLUMBIA RD.
228
229
KUNA RD.
231
232
KUNA MORA RD.
LUCKY PEAK RES.
80
-LEGEND-
BOISE METROPOLITAN AREA
EAGLE (70)
RURAL ADA COUNTY (90)
MERIDIAN (80)
KUNA (80)
201 TRAFFIC ZONE NUMBER

FIGURE 7-9. COMMUNITY PLANNING AREAS OUTSIDE THE BOISE METROPOLITAN AREA

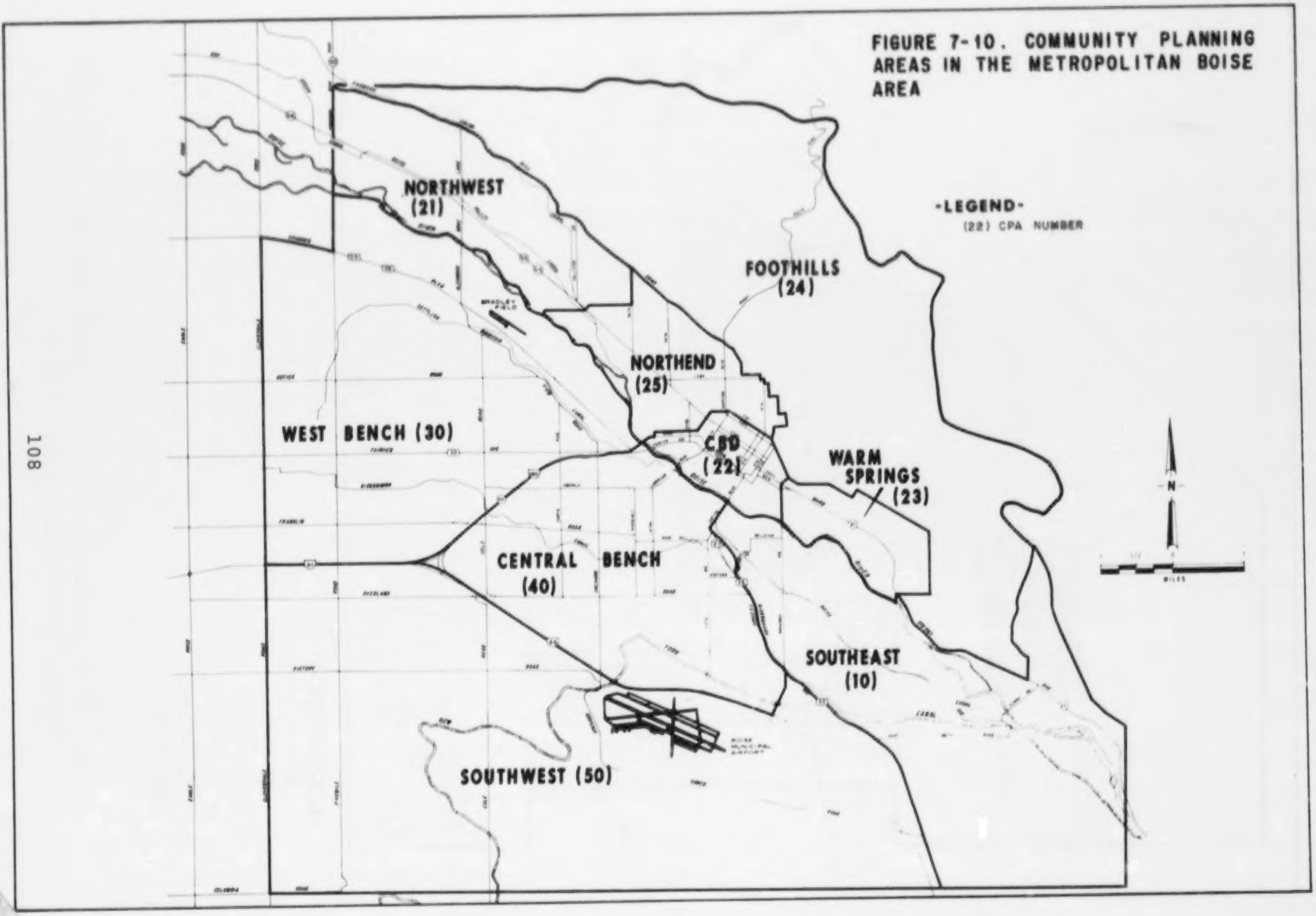


FIGURE 7-10. COMMUNITY PLANNING AREAS IN THE METROPOLITAN BOISE AREA

-LEGEND-
(22) CPA NUMBER
NORTHWEST (21)
FOOTHILLS (24)
NORTHEND (25)
CBD (22)
WARM SPRINGS (23)
WEST BENCH (30)
CENTRAL BENCH (40)
SOUTHEAST (10)
SOUTHWEST (50)
BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
MILES

Table 7-1. Summary of Carbon Monoxide Emission Forecasts for Northern Ada County

Community Planning Area (CPA#)	Emission Source Category	Carbon Monoxide Emissions (pounds) for Indicated Time Periods: 1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total	Percent Contribution to Emissions: 1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total
Southeast Area (19)	Highway Traffic	20,926	35,375	25,635	43,418	23,900	39,438	25,025	38,965	74.9	63.4	75.0	63.5	67.6	51.8	59.9	40.2
	On- & Off-Street Parking	1,802	3,495	2,061	4,072	1,422	2,641	912	1,734	6.4	6.3	6.0	6.0	4.0	3.7	2.2	1.8
	Residential Parking	1,434	2,859	1,876	3,549	1,872	3,336	1,601	2,805	5.1	5.1	5.5	5.2	5.3	4.4	3.8	2.9
	Wood Stoves	3,464	12,753	4,244	15,626	7,507	27,640	13,085	48,179	12.4	22.8	12.4	22.9	21.2	36.3	31.3	49.8
	Fireplaces	313	1,355	383	1,660	678	2,937	1,182	5,119	1.1	2.4	1.1	2.4	1.9	3.9	2.8	5.3
	Other Residential Fuels	1	3	1	3	2	6	3	10	-	-	-	-	-	-	-	-
	Total	27,940	55,840	34,200	68,129	35,381	76,198	41,808	96,812								
Northwest Subarea (21)	Highway Traffic	11,812	19,674	13,779	22,977	11,881	19,385	9,520	14,974	80.6	70.4	78.6	68.2	68.3	52.9	54.6	35.4
	On- & Off-Street Parking	591	941	817	1,305	742	1,132	313	487	4.0	3.4	4.7	3.9	4.3	3.1	1.8	1.1
	Residential Parking	619	1,233	845	1,598	889	1,584	768	1,345	4.2	4.4	4.8	4.7	5.1	4.3	4.4	3.2
	Wood Stoves	1,494	5,500	1,912	7,038	3,564	13,122	6,272	23,093	10.2	19.7	10.9	20.9	20.5	35.8	36.0	54.5
	Fireplaces	135	584	173	748	322	1,394	566	2,454	0.9	2.1	1.0	2.2	1.9	3.8	3.2	5.8
	Other Residential Fuels	-	1	-	2	1	3	2	5	-	-	-	-	-	-	-	-
	Total	14,651	27,933	17,526	33,668	17,399	36,620	17,445	42,358								
CBD Subarea (22)	Highway Traffic	44,004	74,882	50,759	86,653	37,038	62,001	35,053	55,254	85.0	83.5	81.7	84.2	82.0	78.4	84.5	76.8
	On- & Off-Street Parking	5,598	7,673	5,845	8,186	5,371	7,781	2,837	4,037	10.8	8.6	9.4	8.0	11.9	9.8	6.8	5.6
	Residential Parking	606	1,207	731	1,382	511	910	362	635	1.2	1.3	1.2	1.3	1.1	1.2	0.9	0.9
	Wood Stoves	1,463	5,385	1,653	6,086	2,049	7,543	2,961	10,901	2.8	6.0	2.7	5.9	4.5	9.5	7.1	15.1
	Fireplaces	132	572	149	647	185	801	267	1,158	0.3	0.6	0.2	0.6	0.4	1.0	0.6	1.6
	Other Residential Fuels	-	1	-	1	1	2	1	2	-	-	-	-	-	-	-	-
	Total	51,843	89,720	62,137	102,955	45,155	79,040	41,481	71,988								
Warm Springs Subarea (23)	Highway Traffic	4,988	8,391	6,396	10,754	4,817	7,906	5,075	7,842	74.8	61.5	77.4	65.1	71.0	56.1	70.7	51.9
	On- & Off-Street Parking	157	270	137	239	220	291	77	93	2.3	2.2	1.7	1.4	3.2	2.1	1.1	0.6
	Residential Parking	421	839	498	943	325	580	205	359	6.3	6.2	6.0	5.7	4.8	4.1	2.9	2.4
	Wood Stoves	1,017	3,743	1,128	4,152	1,305	4,804	1,675	6,168	15.2	27.4	13.7	25.1	19.2	34.1	23.3	40.8
	Fireplaces	92	398	102	441	118	510	151	655	1.4	2.9	1.2	2.7	1.7	3.6	2.1	4.3
	Other Residential Fuels	-	1	-	1	-	1	-	1	-	-	-	-	-	-	-	-
	Total	6,685	13,642	8,261	16,530	6,785	14,092	7,183	15,119								
Foothills Subarea (24)	Highway Traffic	4,061	6,821	5,007	8,428	5,807	9,548	6,069	9,650	58.3	42.6	59.0	43.6	58.1	40.5	52.4	32.7
	On- & Off-Street Parking	232	474	222	485	117	268	71	84	3.3	3.0	2.6	2.5	1.2	1.1	0.6	0.3
	Residential Parking	736	1,468	940	1,777	758	1,352	286	547	10.6	9.2	11.1	9.2	7.6	5.7	2.5	1.8
	Wood Stoves	1,778	6,547	2,126	7,827	3,041	11,198	4,734	17,429	25.5	40.9	25.0	40.4	30.4	47.5	40.8	58.9
	Fireplaces	161	696	192	832	275	1,190	428	1,852	2.3	4.3	2.3	4.3	2.8	5.1	3.7	6.3
	Other Residential Fuels	-	1	1	2	1	3	1	4	-	-	-	-	-	-	-	-
	Total	6,968	16,007	8,488	19,530	9,999	23,559	11,589	29,574								
Northend Subarea (25)	Highway Traffic	24,207	40,768	27,121	45,753	16,039	26,561	13,885	21,740	75.1	61.0	76.1	62.0	68.0	51.2	66.7	47.1
	On- & Off-Street Parking	247	646	274	702	173	408	70	171	0.8	1.0	0.8	1.0	0.7	0.8	0.3	0.4
	Residential Parking	2,147	4,279	2,372	4,488	1,372	2,445	693	1,214	6.7	6.4	6.7	6.2	5.8	4.7	3.3	2.6
	Wood Stoves	5,184	19,088	5,367	19,762	5,502	20,258	5,662	20,847	16.0	28.6	15.1	27.1	23.3	39.1	27.2	45.1
	Fireplaces	468	2,028	485	2,100	497	2,152	511	2,215	1.5	3.0	1.4	2.9	2.1	4.2	2.5	4.8
	Other Residential Fuels	1	4	1	4	1	4	1	4	-	-	-	-	-	-	-	-
	Total	32,254	66,813	35,620	73,809	23,584	51,829	20,822	46,192								

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Table 7-1 (cont'd.)

Carbon Monoxide Emissions (pounds) for Indicated Time Periods

Community Planning Area (CPA#)	Emission Source Category	1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total
West Bench Area (30)	Highway Traffic	71,383	120,752	84,349	142,637	58,206	96,179	51,443	81,944
	On- & Off-Street Parking	5,545	8,226	5,843	8,743	3,757	5,512	2,246	3,192
	Residential Parking	2,956	5,890	3,458	6,542	2,290	4,080	1,409	2,469
	Wood Stoves	7,137	26,279	7,823	28,805	9,182	33,808	11,517	42,407
	Fireplaces	645	2,792	707	3,061	829	3,592	1,040	4,506
	Other Residential Fuels	2	6	2	6	2	7	3	9
	Total	87,658	163,945	102,182	189,794	74,266	143,138	67,658	134,526
Central Bench Area (40)	Highway Traffic	65,153	112,101	71,419	122,987	54,115	90,442	37,428	60,702
	On- & Off-Street Parking	4,397	6,871	5,148	8,008	2,675	4,128	1,243	1,894
	Residential Parking	3,859	7,691	4,303	8,141	2,581	4,600	1,455	2,548
	Wood Stoves	9,318	34,310	9,735	35,846	10,351	38,113	11,886	43,765
	Fireplaces	842	3,645	879	3,809	935	4,049	1,074	4,650
	Other Residential Fuels	2	7	2	8	3	8	3	9
	Total	83,571	164,626	91,486	178,798	70,660	141,340	53,089	113,569
Southwest Area (50)	Highway Traffic	38,691	66,143	44,348	75,707	35,530	58,848	36,138	56,346
	On- & Off-Street Parking	1,797	2,843	1,814	2,937	1,507	2,377	1,171	1,823
	Residential Parking	921	1,835	1,102	2,235	859	1,532	681	1,193
	Wood Stoves	2,223	8,187	2,673	9,843	3,447	12,691	5,566	20,495
	Fireplaces	201	870	241	1,046	311	1,348	503	2,178
	Other Residential Fuels	1	2	1	2	1	3	1	4
	Total	43,834	79,879	50,259	91,769	41,655	76,799	44,060	82,039
Boise Metropolitan Area Subtotal	Highway Traffic	285,236	484,907	328,813	559,291	247,332	410,271	219,636	347,424
	On- & Off-Street Parking	20,368	31,441	22,163	34,677	15,983	24,738	8,945	13,515
	Residential Parking	13,698	27,299	16,204	30,655	11,458	20,419	7,460	13,115
	Wood Stoves	33,077	121,789	36,660	134,984	45,948	169,180	63,358	233,285
	Fireplaces	2,988	12,940	3,311	14,342	4,150	17,975	5,723	24,787
	Other Residential Fuels	8	26	9	29	11	36	16	50
	Total	355,375	678,402	407,160	774,000	324,882	642,619	305,138	632,175
Meridian Area (60)	Highway Traffic	17,156	28,667	19,306	32,296	10,276	16,830	10,516	16,440
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	633	1,457	794	1,693	672	1,334	626	1,204
	Wood Stoves	1,734	6,386	2,006	7,387	3,008	11,076	5,606	20,643
	Fireplaces	157	679	181	785	272	1,177	506	2,193
	Other Residential Fuels	-	1	1	2	1	2	1	4
	Total	19,680	37,190	22,288	42,163	14,229	30,419	17,255	40,484
Eagle Area (70)	Highway Traffic	5,623	9,387	6,391	10,677	6,085	9,941	5,293	8,278
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	273	628	366	785	320	633	293	562
	Wood Stoves	790	2,908	951	3,503	1,427	5,254	2,591	9,540
	Fireplaces	71	309	86	372	129	558	234	1,014
	Other Residential Fuels	-	1	-	1	-	1	1	2
	Total	6,757	13,233	7,794	15,338	7,961	16,387	8,412	19,395

Percent Contribution to Emissions

Community Planning Area (CPA#)	Emission Source Category	1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total
West Bench Area (30)	Highway Traffic	81.4	73.7	82.5	75.2	78.4	67.2	76.0	60.9
	On- & Off-Street Parking	6.3	5.0	5.7	4.6	5.1	3.9	3.3	2.4
	Residential Parking	3.4	3.6	3.4	3.4	3.1	2.9	2.1	1.8
	Wood Stoves	8.1	16.0	7.7	15.2	12.4	23.6	17.0	31.5
	Fireplaces	0.7	1.7	0.7	1.6	1.1	2.5	1.5	3.3
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								
Central Bench Area (40)	Highway Traffic	78.0	68.1	78.1	68.8	76.6	64.0	70.5	53.4
	On- & Off-Street Parking	5.3	4.2	5.6	4.5	3.8	2.9	2.3	1.7
	Residential Parking	4.6	4.7	4.7	4.6	3.7	3.3	2.7	2.2
	Wood Stoves	11.1	20.8	10.6	20.0	14.6	27.0	22.4	38.5
	Fireplaces	1.0	2.2	1.0	2.1	1.3	2.9	2.0	4.1
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								
Southwest Area (50)	Highway Traffic	88.3	82.8	88.2	82.5	85.3	76.6	82.0	68.7
	On- & Off-Street Parking	4.1	3.6	3.6	3.2	3.6	3.1	2.7	2.2
	Residential Parking	2.1	2.3	2.4	2.4	2.1	2.0	1.5	1.5
	Wood Stoves	5.1	10.2	5.3	10.7	8.3	16.5	12.6	25.0
	Fireplaces	0.5	1.1	0.5	1.1	0.7	1.8	1.1	2.7
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								
Boise Metropolitan Area Subtotal	Highway Traffic	80.3	71.5	80.8	72.3	76.1	63.8	72.0	55.0
	On- & Off-Street Parking	5.7	4.6	5.4	4.5	4.9	3.8	2.9	2.1
	Residential Parking	3.9	4.0	4.0	4.0	3.5	3.2	2.4	2.1
	Wood Stoves	9.3	18.0	9.0	17.4	14.1	26.3	20.8	36.9
	Fireplaces	0.8	1.9	0.8	1.9	1.3	2.8	1.9	3.9
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								
Meridian Area (60)	Highway Traffic	87.2	77.1	86.6	76.6	72.2	55.3	60.9	40.6
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	3.2	3.9	3.6	4.0	4.7	4.4	3.6	3.0
	Wood Stoves	8.8	17.2	9.0	17.5	21.1	36.4	32.5	51.0
	Fireplaces	0.8	1.8	0.8	1.9	1.9	3.9	2.9	5.4
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								
Eagle Area (70)	Highway Traffic	83.2	70.9	82.0	69.6	76.4	60.7	62.9	42.7
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	4.0	4.7	4.7	5.1	4.0	3.9	3.5	2.9
	Wood Stoves	11.7	22.0	12.2	22.8	17.9	32.1	30.8	49.2
	Fireplaces	1.1	2.3	1.1	2.4	1.6	3.4	2.8	5.2
	Other Residential Fuels	-	-	-	-	-	-	-	-
	Total								

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Table 7-1 (cont'd.)

Community Planning Area (CPA#)	Emission Source Category	Carbon Monoxide Emissions (pounds) for Indicated Time Periods: 1977, 10 am-6 pm Period	1977, Daily Total	1980, 10 am-6 pm Period	1980, Daily Total	1987, 10 am-6 pm Period	1987, Daily Total	2000, 10 am-6 pm Period	2000, Daily Total	Percent Contribution to Emissions: 1977, 10 am-6 pm Period	1977, Daily Total	1980, 10 am-6 pm Period	1980, Daily Total	1987, 10 am-6 pm Period	1987, Daily Total	2000, 10 am-6 pm Period	2000, Daily Total
Kuna Area (80)	Highway Traffic	860	1,431	1,036	1,731	864	1,409	794	1,257	62.5	44.1	61.6	44.5	46.7	29.3	30.0	15.9
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	117	262	154	328	159	309	157	300	8.5	8.2	9.2	8.4	8.6	6.4	5.9	3.8
	Wood Stoves	366	1,348	450	1,659	759	2,796	1,557	5,732	26.6	42.3	26.8	42.6	41.0	58.1	58.8	72.6
	Fireplaces	33	143	41	176	69	297	141	609	2.4	4.5	2.4	4.5	3.7	6.2	5.3	7.7
	Other Residential Fuels	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
	Total	1,376	3,184	1,681	3,894	1,851	4,812	2,649	7,899								
Rural Ada County Area (90)	Highway Traffic	56,425	94,016	63,639	106,128	44,407	72,464	35,490	56,092	95.3	90.8	95.2	90.8	92.3	85.1	88.4	77.1
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	657	1,519	805	1,731	602	1,186	399	772	1.1	1.5	1.2	1.5	1.3	1.4	1.0	1.1
	Wood Stoves	1,977	7,278	2,214	8,151	2,829	10,418	3,910	14,398	3.3	7.0	3.3	7.0	5.9	12.2	9.7	19.8
	Fireplaces	179	773	200	866	256	1,107	353	1,530	0.3	0.7	0.3	0.7	0.5	1.3	0.9	2.1
	Other Residential Fuels	-	2	1	3	1	2	1	3	-	-	-	-	-	-	-	-
	Total	59,238	103,588	66,859	116,878	48,095	85,177	40,153	72,795								
Total Northern Ada County	Highway Traffic	365,304	618,405	419,180	710,142	308,960	510,915	271,733	429,436	82.6	74.0	82.9	74.6	77.8	65.6	72.7	55.6
	On- & Off-Street Parking	20,368	31,441	22,163	36,677	15,983	24,738	8,945	13,515	4.6	3.8	4.4	3.6	4.0	3.2	2.4	1.7
	Residential Parking	15,365	31,166	18,334	35,192	13,211	23,878	8,934	15,95	3.5	3.7	3.6	3.7	3.3	3.1	2.4	2.1
	Wood Stoves	37,944	139,709	42,282	155,684	53,971	198,721	77,022	283,59	8.6	16.7	8.4	16.3	13.6	25.5	20.6	36.7
	Fireplaces	3,427	14,044	3,819	16,541	4,875	21,114	6,957	30,13	0.8	1.8	0.8	1.7	1.2	2.7	1.9	3.9
	Other Residential Fuels	9	30	10	33	13	42	19	6	-	-	-	-	-	-	-	-
	Total	442,417	835,595	505,788	952,270	397,013	779,408	373,610	772,752								

Notes and Sources:

Emission forecasting procedures are discussed in Appendix A.

Residential parking component separated from total parking emissions by applying a programmable calculator version of the parking emissions program to estimated daily home-based vehicle trips listed in Table 7-3. Resulting estimates for CPAs 60, 70, 80, and 90 disregarded, and computer program output for total parking emissions used instead. Year 2000 results for CPA 24 also disregarded due to inconsistency with computer program output. For CPA 24, emissions from traffic zone 87 were allocated to on- and off-street parking, with the remainder allocated to residential parking. Inconsistencies are due primarily to procedures used to estimate home-based vehicle trips for each CPA.

Results may not add to subtotals or totals due to rounding and/or independent calculation of subtotals and totals.

NC = Not calculated; no on- and off-street parking surveys available for this area.

"—" = Less than 0.5 pound of emissions, or less than 0.05 percent of total emissions.

Table 7-2. Carbon Monoxide Emission Densities in Northern Ada County

Community Planning Area (CPA#)	Emission Source Category	Relative Emission Densities[1] for Source Areas (pounds per acre)								Percent Contribution to ESDI[2]							
		1977		1980		1987		2000		1977		1980		1987		2000	
		10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total	10 am-6 pm Period	Daily Total
Southeast Area (10)	Highway Traffic	123.31	208.46	137.33	232.60	85.36	140.85	89.38	139.16	78.6	74.6	80.1	76.1	81.0	75.6	89.3	84.1
	On- & Off-Street Parking	29.16	56.56	29.63	58.55	16.03	32.03	7.16	13.62	18.6	20.2	17.3	19.2	15.2	17.2	7.2	8.2
	Residential Parking	1.23	2.45	1.31	2.48	0.74	1.32	0.36	0.64	0.8	0.9	0.8	0.8	0.7	0.7	0.4	0.4
	Residential Fuel Use	3.23	12.07	3.23	12.07	3.23	12.07	3.23	12.07	2.1	4.3	1.9	3.9	3.1	6.5	3.2	7.3
	ESDI[2]	156.93	279.54	171.50	305.70	105.36	186.27	100.13	165.49								
Northwest Subarea (21)	Highway Traffic	126.56	210.79	147.63	246.18	116.69	190.39	93.50	147.07	75.9	74.7	78.1	77.0	82.3	80.6	88.2	84.7
	On- & Off-Street Parking	35.52	56.56	36.66	58.55	20.99	32.03	8.87	13.62	21.3	20.0	19.4	18.3	14.8	13.6	8.4	7.8
	Residential Parking	1.26	2.51	1.34	2.54	0.76	1.35	0.37	0.65	0.8	0.9	0.7	0.8	0.5	0.6	0.3	0.4
	Residential Fuel Use	3.31	12.37	3.31	12.38	3.31	12.38	3.31	12.37	2.0	4.4	1.8	3.9	2.3	5.2	3.1	7.1
	ESDI[2]	166.65	282.23	188.94	319.65	141.75	236.15	106.05	173.71								
CBD Subarea (22)	Highway Traffic	235.74	401.15	271.92	464.21	181.88	304.48	172.14	271.34	83.7	84.9	85.4	86.3	87.4	86.9	92.9	91.1
	On- & Off-Street Parking	41.26	56.56	41.81	58.55	22.11	32.03	9.57	13.62	14.7	12.0	13.1	10.9	10.6	9.1	5.2	4.6
	Residential Parking	1.26	2.51	1.34	2.54	0.76	1.35	0.37	0.65	0.4	0.5	0.4	0.5	0.4	0.4	0.2	0.2
	Residential Fuel Use	3.32	12.39	3.31	12.38	3.32	12.38	3.31	12.37	1.2	2.6	1.0	2.3	1.6	3.5	1.8	4.2
	ESDI[2]	281.58	472.61	318.38	537.68	208.07	350.24	185.39	297.98								
Warm Springs Subarea (23)	Highway Traffic	147.26	247.21	188.45	316.86	141.93	232.94	149.53	231.06	79.7	77.6	83.1	81.2	83.4	83.6	90.9	89.7
	On- & Off-Street Parking	32.89	56.56	33.56	58.55	24.22	32.03	11.28	13.62	17.8	17.7	14.8	15.0	14.2	11.5	6.9	5.3
	Residential Parking	1.26	2.50	1.34	2.54	0.76	1.35	0.37	0.65	0.7	0.8	0.6	0.7	0.4	0.5	0.2	0.3
	Residential Fuel Use	3.31	12.36	3.32	12.38	3.31	12.36	3.31	12.38	1.8	3.9	1.5	3.2	1.9	4.4	2.0	4.8
	ESDI[2]	184.72	318.65	226.67	390.33	170.22	278.68	164.49	257.71								
Foothills Subarea (24)	Highway Traffic	36.82	61.84	45.39	76.41	52.65	86.56	55.02	87.56	56.1	50.7	61.9	55.1	77.9	71.0	81.7	84.0
	On- & Off-Street Parking	27.68	56.56	26.80	58.55	13.98	32.03	11.51	13.62	42.2	46.3	36.5	42.2	20.7	26.3	17.1	13.1
	Residential Parking	0.31	0.61	0.35	0.66	0.18	0.33	0.04	0.09	0.5	0.5	0.5	0.5	0.3	0.3	0.1	0.1
	Residential Fuel Use	0.81	3.02	0.81	3.02	0.81	3.02	0.81	3.02	1.2	2.5	1.1	2.2	1.2	2.5	1.2	2.9
	ESDI[2]	65.62	122.03	73.35	138.64	67.62	121.94	67.38	104.29								
Northend Subarea (25)	Highway Traffic	190.20	320.32	213.09	359.49	145.41	240.80	125.88	197.09	87.9	81.8	88.6	83.0	89.2	84.0	93.1	88.1
	On- & Off-Street Parking	21.63	56.56	22.85	58.55	13.58	32.03	5.58	13.62	10.0	14.4	9.5	13.5	8.3	11.2	4.1	6.1
	Residential Parking	1.26	2.51	1.34	2.54	0.76	1.35	0.37	0.65	0.6	0.6	0.6	0.6	0.5	0.5	0.3	0.3
	Residential Fuel Use	3.31	12.37	3.31	12.37	3.31	12.38	3.31	12.37	1.5	3.2	1.4	2.9	2.0	4.3	2.4	5.5
	ESDI[2]	216.40	391.76	240.59	432.95	163.06	286.56	135.14	223.73								
West Bench Area (30)	Highway Traffic	147.60	249.68	165.69	280.18	112.46	185.75	99.39	158.32	77.8	78.3	79.4	79.7	81.6	80.9	88.6	86.5
	On- & Off-Street Parking	38.13	56.56	39.13	58.55	21.83	32.03	9.58	13.62	20.1	17.7	18.7	16.7	15.8	14.0	8.5	7.4
	Residential Parking	1.07	2.14	1.15	2.17	0.65	1.15	0.32	0.56	0.6	0.7	0.6	0.6	0.5	0.5	0.3	0.3
	Residential Fuel Use	2.83	10.57	2.83	10.56	2.83	10.56	2.83	10.57	1.5	3.3	1.4	3.0	2.1	4.6	2.5	5.8
	ESDI[2]	189.63	318.95	208.80	351.46	137.77	229.49	112.12	183.07								

Table 7-2 (cont'd.)

Community Planning Area (CPA#)	Emission Source Category	Relative Emission Densities[1] for Source Areas (pounds per acre) 1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total	Percent Contribution to ESDI[2] 1977 10 am-6 pm Period	1977 Daily Total	1980 10 am-6 pm Period	1980 Daily Total	1987 10 am-6 pm Period	1987 Daily Total	2000 10 am-6 pm Period	2000 Daily Total
Central Bench Area (40)	Highway Traffic	170.64	293.60	187.05	322.11	138.65	231.72	95.89	155.53	81.1	81.2	81.9	82.1	85.3	84.4	89.0	86.7
	On- & Off-Street Parking	36.19	56.56	37.64	58.55	20.76	32.03	8.94	13.62	17.2	15.6	16.5	14.9	12.8	11.7	8.3	7.6
	Residential Parking	0.98	1.96	1.05	1.98	0.59	1.05	0.29	0.51	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3
	Residential Fuel Use	2.59	9.66	2.59	9.66	2.59	9.66	2.59	9.66	1.2	2.7	1.1	2.5	1.6	3.5	2.4	5.4
	ESDI[2]	210.40	361.78	228.33	392.30	162.59	274.46	107.71	179.32								
Southwest Area (50)	Highway Traffic	66.09	112.98	75.75	129.31	60.69	100.52	61.73	98.24	64.0	64.8	66.8	67.1	73.8	73.4	86.2	84.4
	On- & Off-Street Parking	35.75	56.56	36.16	58.55	20.31	32.03	8.75	13.62	34.6	32.5	31.9	30.4	24.7	23.4	12.2	11.9
	Residential Parking	0.40	0.80	0.43	0.81	0.24	0.43	0.12	0.21	0.4	0.5	0.4	0.4	0.3	0.3	0.2	0.2
	Residential Fuel Use	1.05	3.93	1.05	3.92	1.05	3.92	1.05	3.92	1.0	2.3	0.9	2.0	1.3	2.9	1.5	3.4
	ESDI[2]	103.29	174.27	113.39	192.59	82.29	136.90	71.65	115.99								
Average, Boise Metropolitan Area	Highway Traffic	131.31	223.24	148.48	252.55	106.00	175.83	94.13	148.90	70.7	76.9	78.5	78.6	81.9	80.9	89.2	87.0
	On- & Off-Street Parking	36.64	56.56	37.42	58.55	20.70	32.03	9.02	13.62	26.9	19.5	19.8	18.2	16.0	14.7	8.5	8.0
	Residential Parking	0.80	1.75	0.93	1.75	0.52	0.92	0.24	0.42	0.6	0.6	0.5	0.5	0.4	0.4	0.2	0.2
	Residential Fuel Use	2.32	8.65	2.28	8.53	2.26	8.43	2.19	8.20	1.7	3.0	1.2	2.7	1.7	3.9	2.1	4.8
	ESDI[2]	136.08	290.20	189.11	321.38	129.48	217.21	105.58	171.14								
Meridian Area (60)	Highway Traffic	72.21	120.66	81.26	135.94	48.44	79.34	49.58	77.50	95.7	91.7	96.1	92.6	94.3	88.8	94.9	89.0
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	0.81	1.87	0.88	1.87	0.50	0.99	0.25	0.48	1.1	1.4	1.0	1.3	1.0	1.1	0.5	0.6
	Residential Fuel Use	2.42	9.06	2.42	9.05	2.42	9.06	2.42	9.06	3.2	6.9	2.9	6.2	4.7	10.1	4.6	10.4
	ESDI[2]	75.44	131.59	84.56	146.86	51.36	89.39	52.25	87.04								
Eagle Area (70)	Highway Traffic	73.63	122.93	83.69	139.82	59.76	97.63	51.98	81.30	95.8	91.9	96.2	92.8	95.3	90.7	95.1	89.5
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	0.77	1.77	0.86	1.83	0.50	0.99	0.25	0.48	1.0	1.3	1.0	1.2	0.8	0.9	0.5	0.5
	Residential Fuel Use	2.41	9.06	2.42	9.06	2.42	9.05	2.42	9.05	3.2	6.8	2.8	6.0	3.9	8.4	4.4	10.0
	ESDI[2]	76.81	133.76	86.97	150.71	62.68	107.67	54.65	90.83								
Kuna Area (80)	Highway Traffic	11.26	18.74	13.57	22.67	11.31	18.45	10.40	16.46	78.2	63.8	81.0	68.0	79.7	65.0	79.7	63.4
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	0.71	1.59	0.76	1.62	0.46	0.90	0.22	0.43	4.9	5.4	4.5	4.9	3.2	3.2	1.7	1.7
	Residential Fuel Use	2.42	9.04	2.42	9.04	2.42	9.05	2.43	9.06	16.8	30.8	14.4	27.1	17.1	31.9	18.6	34.9
	ESDI[2]	14.39	29.37	16.75	33.33	14.19	28.40	13.05	25.95								
Rural Ada County Area (90)	Highway Traffic	28.42	47.35	32.05	53.65	23.36	38.13	18.67	29.51	96.4	93.0	96.7	93.7	96.0	92.0	95.4	90.3
	On- & Off-Street Parking	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
	Residential Parking	0.25	0.57	0.27	0.50	0.16	0.31	0.08	0.15	0.8	1.1	0.8	1.0	0.7	0.7	0.4	0.5
	Residential Fuel Use	0.81	3.02	0.81	3.02	0.81	3.02	0.81	3.02	2.7	5.9	2.4	5.3	3.3	7.3	4.1	9.2
	ESDI[2]	29.47	50.94	33.13	57.05	24.33	41.46	19.56	32.68								
Average, Northern Ada County	Highway Traffic	80.32	134.72	91.32	154.70	66.81	110.49	58.76	92.88	67.0	67.1	57.3	69.5	74.2	62.2	83.9	81.1
	On- & Off-Street Parking	36.64	56.56	37.42	58.55	20.70	32.03	9.02	13.62	30.6	28.2	36.0	26.3	23.0	29.8	12.9	11.9
	Residential Parking	0.79	1.59	0.83	1.60	0.47	0.84	0.22	0.39	0.7	0.8	1.0	0.7	0.5	0.8	0.3	0.3
	Residential Fuel Use	2.12	7.91	2.09	7.82	2.07	7.75	2.04	7.62	1.8	3.9	4.9	3.5	2.3	7.2	2.9	6.7
	ESDI[2]	119.87	200.78	159.26	222.67	90.05	107.63	70.04	114.51								

NOTES AND SOURCES:

NC = Not calculated due to lack of parking survey data.

[1] Relative Emission Density = Source category emissions from Table 7-1 divided by estimated acreage of emission source category. Highway acreages based on roadway miles (Table 7-3) and assumed average roadway width of 70 feet. On- and off-street parking acreage estimated for Boise Metropolitan Area as a whole using hand tabulation of parking facility data files and assumed average of 420 square feet per parking space. Average source density for metropolitan area used as daily total value for all component CPAs. 10 a.m.-6 p.m. values for each CPA calculated from ratio of 8-hour to daily emissions in Table 7-1. Residential acreages from Table 7-3 used for residential parking and residential fuel use categories.

[2] ESDI = Emission Source Density Index. This index calculated as the sum of source category relative emission densities.

The emission source density values in Table 7-2 indicate that vehicle activity (highway traffic and parking activities) is clearly the dominant factor in existing CO problems. Current and projected composite emission source density index (ESDI) values for the various community planning areas in the Boise area are shown in Figures 7-11, 7-12, and 7-13. The dominant influence of vehicle emissions is also apparent from the ambient air quality monitoring data discussed previously. Data used to develop the ESDI values, as well as other pertinent characteristics of each community planning area, are summarized in Table 7-3.

The significance of different emission source categories cannot be fully evaluated solely from the percent contribution columns of Table 7-1 or 7-2. The percent contribution of any source category is, to a major extent, a reflection of the significance of other sources in a particular community planning area. For example, 1980 on- and off-street parking emissions in the Foothills subarea contribute substantially to the ESDI value (Table 7-2). This is largely a reflection of the minimal amount of vehicle traffic in that area, rather than an indication of massive amounts of parking-related emissions (compare Tables 7-1 and 7-2).

Future Air Pollution Potential in Ada County

The implications of projected emission levels have been evaluated using simple proportionality ("rollback") techniques (see Appendix H). Each community planning area has been analyzed as a discrete subarea, without considering the possibility of pollutant transport between areas. The use of such procedures requires selection of a base year from which to extrapolate potential pollution levels. The ambient monitoring data summarized previously show that the 1976-1977 period experienced the most frequent and severe CO episodes yet reported. The emission inventories presented in Table 7-1 indicate that recent reductions in the frequency and magnitude of pollution episodes do not result from reductions in pollutant emissions. Meteorological conditions (inversion frequency and intensity, wind conditions, etc.), appear to be the controlling factors. Thus, 1977 represents an indicator of potential CO levels under unfavorable weather conditions.

The procedures used for this analysis have not dealt with the possibility of significant pollutant transport between community planning areas. As discussed in Appendix G, available monitoring data demonstrate only neighborhood scale transport events.

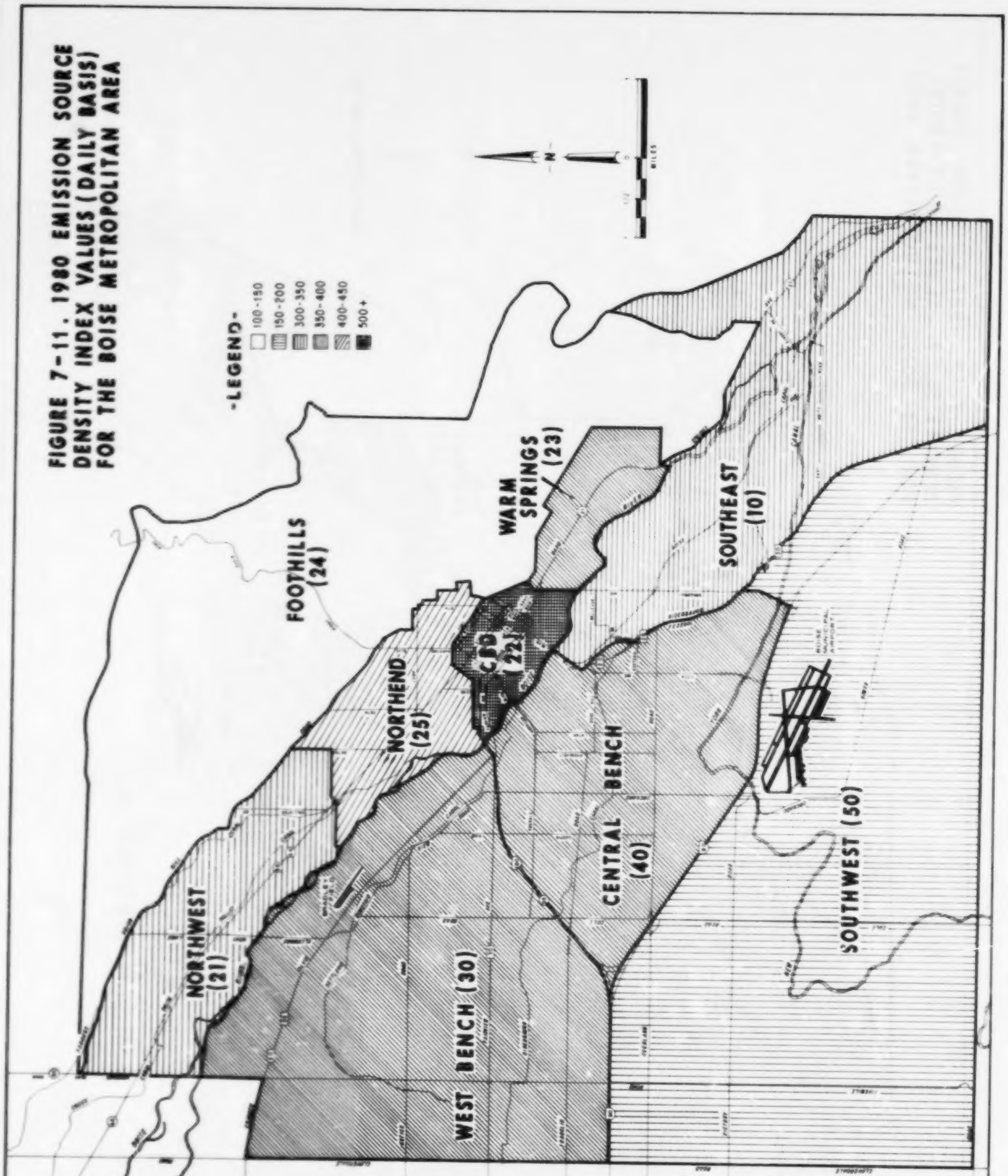


FIGURE 7-11. 1980 EMISSION SOURCE DENSITY INDEX VALUES (DAILY BASIS) FOR THE BOISE METROPOLITAN AREA

-LEGEND-
□ 100-150
▥ 150-200
▤ 300-350
▩ 350-400
▨ 400-450
■ 500+
N
MILES
FOOTHILLS (24)
WARM SPRINGS (23)
SOUTHEAST (10)
CBD (22)
NORTHEND (25)
CENTRAL BENCH (40)
NORTHWEST (21)
WEST BENCH (30)
SOUTHWEST (50)
BOISE MUNICIPAL AIRPORT

FIGURE 7-12. 1987 EMISSION SOURCE DENSITY INDEX VALUES (DAILY BASIS) FOR THE BOISE METROPOLITAN AREA

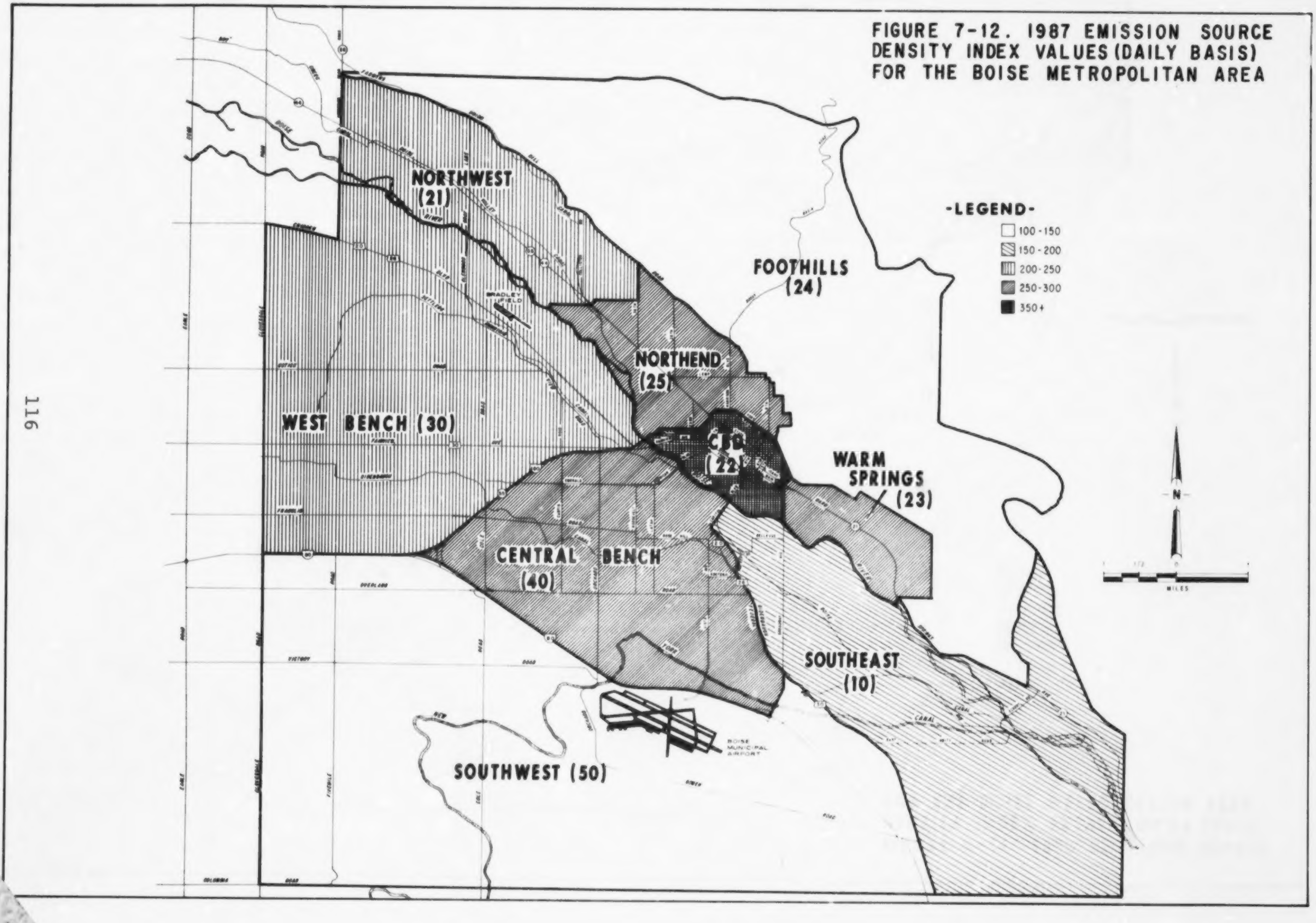
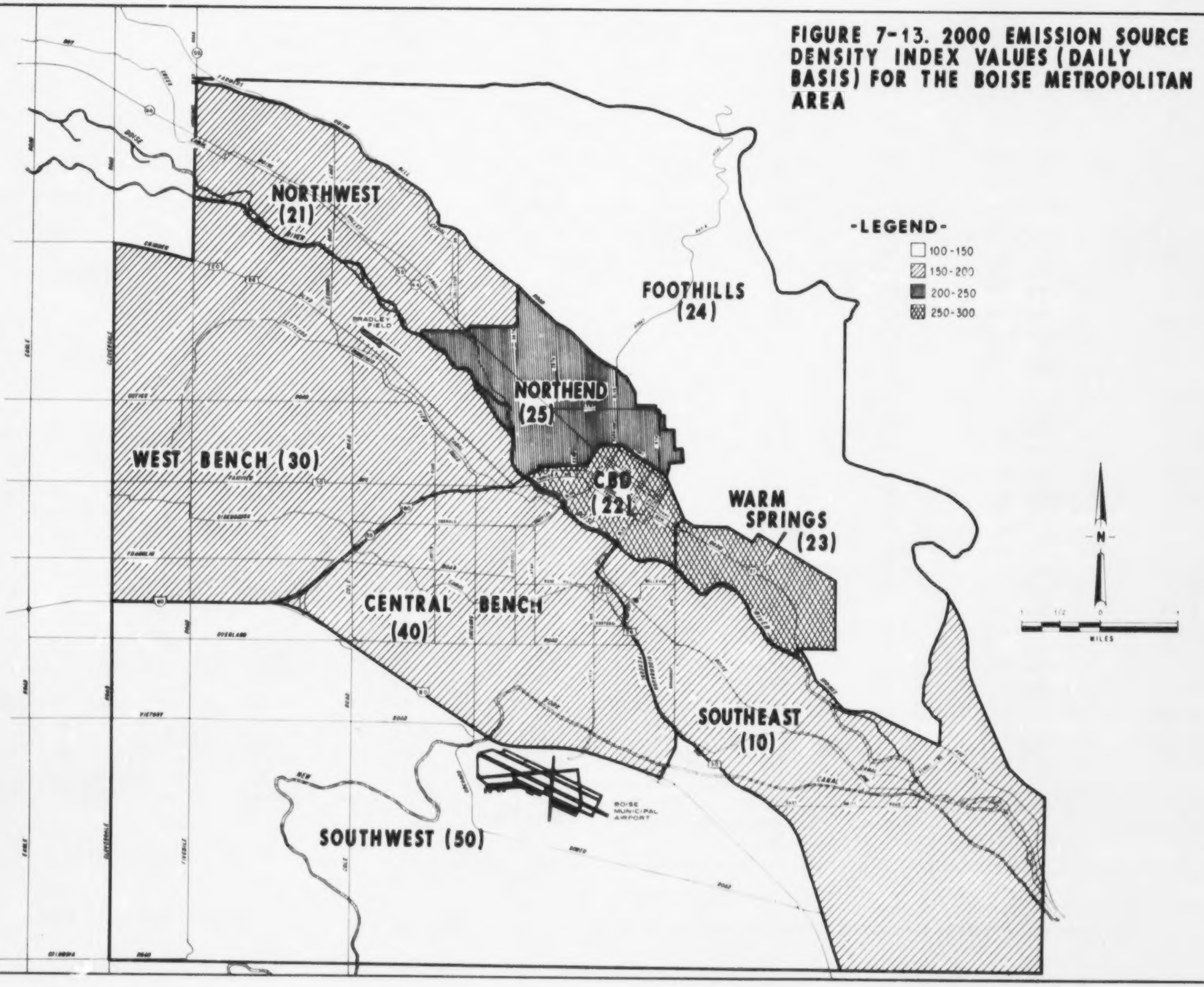

-LEGEND-
□ 100-150
▧ 150-200
▥ 200-250
▨ 250-300
■ 350+
NORTHWEST (21)
WEST BENCH (30)
NORTHEND (25)
FOOTHILLS (24)
CBD (22)
WARM SPRINGS (23)
CENTRAL BENCH (40)
SOUTHEAST (10)
SOUTHWEST (50)
BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
MILES

FIGURE 7-13. 2000 EMISSION SOURCE DENSITY INDEX VALUES (DAILY BASIS) FOR THE BOISE METROPOLITAN AREA



-LEGEND-
☐ 100-150
▨ 150-200
■ 200-250
▩ 250-300
NORTHWEST (21)
FOOTHILLS (24)
NORTHEND (25)
CBD (22)
WARM SPRINGS (23)
WEST BENCH (30)
CENTRAL BENCH (40)
SOUTHEAST (10)
SOUTHWEST (50)
BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
1/2
0
1
MILES

Table 7-3. Community Planning Area Characteristics Reflected in the Emission Inventories and Forecasts

Community Planning Area (CPA #)	Year	Population[1]	Dwelling Units[1]	Total Acreage[1]	Residential Acreage[2]	Roadway Miles[3]	Daily Vehicle Miles Traveled[3]	Daily Home-Based Vehicle Trips[4]
Southeast Area (10)	1977	13,578	4,675	8,503	1,169	20	118,241	34,556
	1980	16,808	5,728	8,503	1,432	22	147,878	43,266
	1987	29,702	10,132	8,503	2,533	33	270,901	80,827
	2000	49,831	17,661	8,503	4,415	33	495,573	148,887
Northwest Subarea (21)	1977	6,327	2,016	3,880	492	11	78,560	14,902
	1980	7,853	2,580	3,880	629	11	92,402	19,488
	1987	14,411	4,810	3,880	1,173	12	153,431	38,371
	2000	24,455	8,465	3,880	2,065	12	229,285	71,362
CBD Subarea (22)	1977	3,178	1,974	1,084	481	22	221,750	14,591
	1980	3,534	2,231	1,084	544	22	257,537	16,852
	1987	4,366	2,765	1,084	674	24	360,418	22,058
	2000	6,655	3,996	1,084	975	24	596,172	33,687
Warm Springs Subarea (23)	1977	3,698	1,372	1,090	335	4	30,569	10,141
	1980	4,003	1,522	1,090	371	4	40,043	11,496
	1987	4,553	1,761	1,090	430	4	57,951	14,048
	2000	5,574	2,261	1,090	551	4	100,696	19,061
Foothills Subarea (24)	1977	7,603	2,400	14,021	2,400	13	24,645	17,740
	1980	8,921	2,869	14,021	2,869	13	31,026	21,671
	1987	12,529	4,105	14,021	4,105	13	71,089	32,747
	2000	18,850	6,389	14,021	6,389	13	143,629	53,861
Northend Subarea (25)	1977	17,458	6,997	2,141	1,707	15	142,791	51,720
	1980	17,874	7,244	2,141	1,767	15	161,512	54,717
	1987	17,957	7,426	2,141	1,811	13	178,029	59,240
	2000	18,110	7,642	2,141	1,864	13	260,063	64,424
West Bench Area (30)	1977	30,276	9,633	11,182	2,752	57	462,544	71,204
	1980	32,640	10,559	11,182	3,017	60	538,089	79,757
	1987	37,565	12,393	11,182	3,541	61	699,132	98,864
	2000	45,115	15,545	11,182	4,441	61	1,102,625	131,049
Central Bench Area (40)	1977	36,749	12,577	6,198	3,930	45	411,511	92,965
	1980	37,716	13,140	6,198	4,106	45	456,623	99,253
	1987	39,248	13,971	6,198	4,366	46	637,459	111,453
	2000	43,355	16,043	6,198	5,013	46	843,049	135,247
Southwest Area (50)	1977	10,277	3,001	18,383	2,308	69	271,411	22,182
	1980	12,072	3,608	18,383	2,775	69	313,706	27,253
	1987	14,914	4,652	18,383	3,578	69	472,042	37,111
	2000	22,380	7,513	18,383	5,779	69	800,122	63,337
Subtotal, Boise Metropolitan Area	1977	129,144	44,644	66,482	15,574	256	1,762,022	329,995
	1980	141,427	49,481	66,482	17,510	261	2,038,816	373,753
	1987	175,244	62,016	66,482	22,211	275	2,900,452	494,728
	2000	234,050	85,516	66,482	31,492	275	4,571,214	720,925

Community Planning Area (CPA #)	Year	Population[1]	Dwelling Units[1]	Total Acreage[1]	Residential Acreage[2]	Roadway Miles[3]	Daily Vehicle Miles Traveled[3]	Daily Home-Based Vehicle Trips[4]
Meridian Area (60)	1977	7,295	2,341	10,560	780	28	111,456	17,304
	1980	8,593	2,708	10,560	903	28	127,620	20,394
	1987	12,639	4,060	10,560	1,353	25	129,427	32,388
	2000	22,122	7,567	10,560	2,522	25	235,621	63,792
Eagle Area (70)	1977	3,152	1,066	9,728	355	9	36,810	7,880
	1980	3,800	1,284	9,728	428	9	42,199	9,699
	1987	5,696	1,926	9,728	642	12	77,992	15,365
	2000	10,225	3,497	9,728	1,166	12	122,956	29,481
Kuna Area (80)	1977	1,626	494	3,520	165	9	5,791	3,651
	1980	2,004	608	3,520	203	9	7,082	4,593
	1987	3,301	1,025	3,520	342	9	11,296	8,177
	2000	6,415	2,101	3,520	700	9	20,265	29,675
Rural Ada County Area (90)	1977	8,507	2,668	335,598	2,668	234	379,333	19,721
	1980	9,393	2,988	335,598	2,988	234	433,013	22,570
	1987	11,794	3,819	335,598	3,819	224	533,280	30,466
	2000	15,913	5,278	335,598	5,278	224	837,644	44,495
Total, Northern Ada County	1977	149,724	51,213	425,888	19,542	536	2,295,412	378,551
	1980	165,211	57,069	425,888	22,032	541	2,648,730	431,069
	1987	208,674	72,847	425,888	28,367	545	3,652,447	581,132
	2000	289,000	103,958	425,888	41,158	545	5,787,700	876,396

Notes and Sources:

[1] Tabulated from data in APA 1978, reflecting traffic zone aggregations as used in the Boise traffic model.

[2] Calculated from dwelling unit values assuming 4.0 units per acre in CPA 10; 4.1 units per acre in CPAs 21, 22, 23, and 25; 1.0 unit per acre in CPAs 24 and 90; 3.5 units per acre in CPA 30; 3.2 units per acre in CPA 40; 1.3 units per acre in CPA 50; and 3.0 units per acre in CPAs 60, 70, and 80. Dwelling unit per acre values selected by Jones & Stokes Associates staff based on data in APA 1978.

[3] From Boise traffic model output; computer runs made in November 1980.

[4] Calculated for each CPA using areawide average trip generation rates; areawide trip generation rates calculated separately for each forecast year from traffic model output of total home-based vehicle trips and total dwelling units listed above. All vehicle trip numbers represent sum of trips in both directions. Values are preliminary estimates, subject to revision when specific CPA summaries become available directly from the traffic model.

Estimates of future air pollution potential are presented in Table 7-4. Potential CO levels were analyzed as two components: a "background" increment related to total emissions in each planning area, and a roadway corridor increment related to highway traffic and nonresidential parking emissions. Table 7-4 makes it clear that CO problems can be expected to persist at least to the year 2000 in several portions of the Boise metropolitan area. The effects of existing vehicle emission control requirements are accounted for in the emission forecasts used for this analysis.

The procedures used to develop Table 7-4 have also been used to estimate the extent of emission reduction which would be necessary to predict attainment of the federal 8-hour CO standard in each of the four analysis years (Table 7-5). To meet the 1987 deadline established by the Clean Air Act, projected 1987 emissions must be reduced by as much as 53 percent in some community planning areas. The greatest emission reduction requirements for the 1987 period apply to the Central Bench, CBD, and West Bench community planning areas. The extent of emission reduction requirements for 1987 and 2000 are shown in Figures 7-14 and 7-15.

Table 7-6 summarizes the assumptions used in this analysis regarding 1977 background CO increments and overall 8-hour CO levels. Background CO values for the CBD area were selected after reviewing the hourly CO data for the downtown monitoring station. Background CO values for other planning areas were selected on the basis of other monitoring data and the emission source density index values for 1977. Base year ambient CO values for each planning area were developed separately for valley and bench areas. Data from the downtown monitoring station were used for valley areas. The second-highest 8-hour CO episode for 1977 (18.3 ppm) was assigned to the CBD area. Base year CO values for other planning areas were extrapolated from this on the basis of emission source density index values. A similar procedure was used for the bench areas. The second highest 8-hour CO event reported from the Idaho Air Quality Bureau special CO study (21.0 ppm) was assigned to the central bench planning area. Emission source density index values were used to extrapolate base year CO values for other planning areas.

The Southeast area (CPA 10) deserves some special discussion. This planning area was treated as a valley location. The western end of the area, however, is on the bench. The Idaho Air Quality Bureau special study reported an 8-hour CO value of 17.7 ppm from a site along Broadway Avenue. This is substantially higher than the 10.2 ppm CO value assigned to this planning area in Table 7-6. The 10.2 ppm value seems quite reasonable for most of the Southeast area. Interpretation of Tables 7-4 and 7-5 (as well as Figures 7-14 and 7-15)

Table 7-4. Forecasts of Air Pollution Potential

Community Planning Area (CPA #)	Emission Forecast Basis	Potential 8-Hour Carbon Monoxide Levels (ppm)			
		1977	1980	1987	2000
Southeast Area (10)	10 am-6 pm	10.2	12.4	11.5	12.0
	Daily Total	10.2	12.5	11.4	11.4
Northwest Subarea (21)	10 am-6 pm	10.8	12.7	11.2	8.2
	Daily Total	10.8	12.7	11.1	8.9
CBD Subarea (22)	10 am-6 pm	18.3	21.0	15.7	14.1
	Daily Total	18.3	21.0	15.5	13.3
Warm Springs Subarea (23)	10 am-6 pm	12.0	15.2	11.8	12.1
	Daily Total	12.0	15.1	11.5	11.3
Foothills Subarea (24)	10 am-6 pm	4.3	5.2	6.0	6.3
	Daily Total	4.3	5.3	5.8	6.0
Northend Subarea (25)	10 am-6 pm	14.1	15.8	9.5	8.2
	Daily Total	14.1	15.8	9.4	7.8
West Bench Area (30)	10 am-6 pm	18.9	22.1	15.3	13.3
	Daily Total	18.9	22.2	15.0	12.7
Central Bench Area (40)	10 am-6 pm	21.0	23.1	17.2	11.8
	Daily Total	21.0	23.1	16.8	11.4
Southwest Area (50)	10 am-6 pm	10.3	11.7	9.5	9.6
	Daily Total	10.3	11.8	9.2	8.9
Meridian Area (60)	10 am-6 pm	7.5	8.4	4.6	4.7
	Daily Total	7.5	8.5	4.5	4.6
Eagle Area (70)	10 am-6 pm	5.0	5.7	5.5	4.9
	Daily Total	5.0	5.7	5.4	4.7
Kuna Area (80)	10 am-6 pm	1.4	1.7	1.4	1.4
	Daily Total	1.4	1.7	1.4	1.4
Rural Ada County Area (90)	10 am-6 pm	2.9	3.3	2.3	1.8
	Daily Total	2.9	3.3	2.2	1.7

NOTES AND SOURCES:

Forecasts prepared using simple proportionality ("rollback") procedures, with "background" CO increment proportional to change in total CPA emissions and "corridor" CO increment proportional to change in highway plus nonresidential parking emissions for CPA. Each CPA treated separately (no pollutant transport between CPAs).

1977 used as a uniform base year, since that year showed the highest ratios of observed CO levels to estimated emissions.

"Background" and base year ambient CO values for each CPA shown in Table 7-6. Emission estimates and forecasts shown in Table 7-1.

ppm = parts per million, by volume.

Table 7-5. Reductions From Projected CPA Emissions Required To Indicate Attainment of 8-Hour CO Standard

Community Planning Area (CPA#)	Emission Forecast Basis	Required Percent Reduction From Projected Emissions			
		1977	1980	1987	2000
Southeast Area (10)	10 am-6 pm	13.04	30.64	24.55	28.53
	Daily Total	13.04	30.82	23.70	24.57
Northwest Subarea (21)	10 am-6 pm	18.37	32.33	21.67	0.0
	Daily Total	18.37	32.47	21.17	0.0
CBD Subarea (22)	10 am-6 pm	57.06	64.50	47.92	40.57
	Daily Total	57.06	64.19	47.47	36.83
Warm Springs Subarea (23)	10 am-6 pm	28.57	46.30	27.12	29.59
	Daily Total	28.57	46.11	25.03	23.74
Foothills Subarea (24)	10 am-6 pm	0.0	0.0	0.0	0.0
	Daily Total	0.0	0.0	0.0	0.0
Northend Subarea (25)	10 am-6 pm	42.15	49.90	6.04	0.0
	Daily Total	42.15	49.75	5.47	0.0
West Bench Area (30)	10 am-6 pm	56.90	64.45	44.85	35.42
	Daily Total	56.90	64.43	43.92	32.36
Central Bench Area (40)	10 am-6 pm	63.16	67.44	52.89	26.83
	Daily Total	63.16	67.36	51.78	23.77
Southwest Area (50)	10 am-6 pm	13.98	25.93	5.38	6.71
	Daily Total	13.98	25.95	2.61	0.0
Meridian Area (60)	10 am-6 pm	0.0	0.0	0.0	0.0
	Daily Total	0.0	0.0	0.0	0.0
Eagle Area (70)	10 am-6 pm	0.0	0.0	0.0	0.0
	Daily Total	0.0	0.0	0.0	0.0

Table 7-5 (cont'd.)

Community Planning Area (CPA#)	Emission Forecast Basis	Required Percent Reduction From Projected Emissions			
		1977	1980	1987	2000
Kuna Area (80)	10 am-6 pm	0.0	0.0	0.0	0.0
	Daily Total	0.0	0.0	0.0	0.0
Rural Ada County (90)	10 am-6 pm	0.0	0.0	0.0	0.0
	Daily Total	0.0	0.0	0.0	0.0

Notes and Sources:

Based on proportionality (rollback) procedures discussed in text.

Supporting emission forecasts presented in Table 7-1.

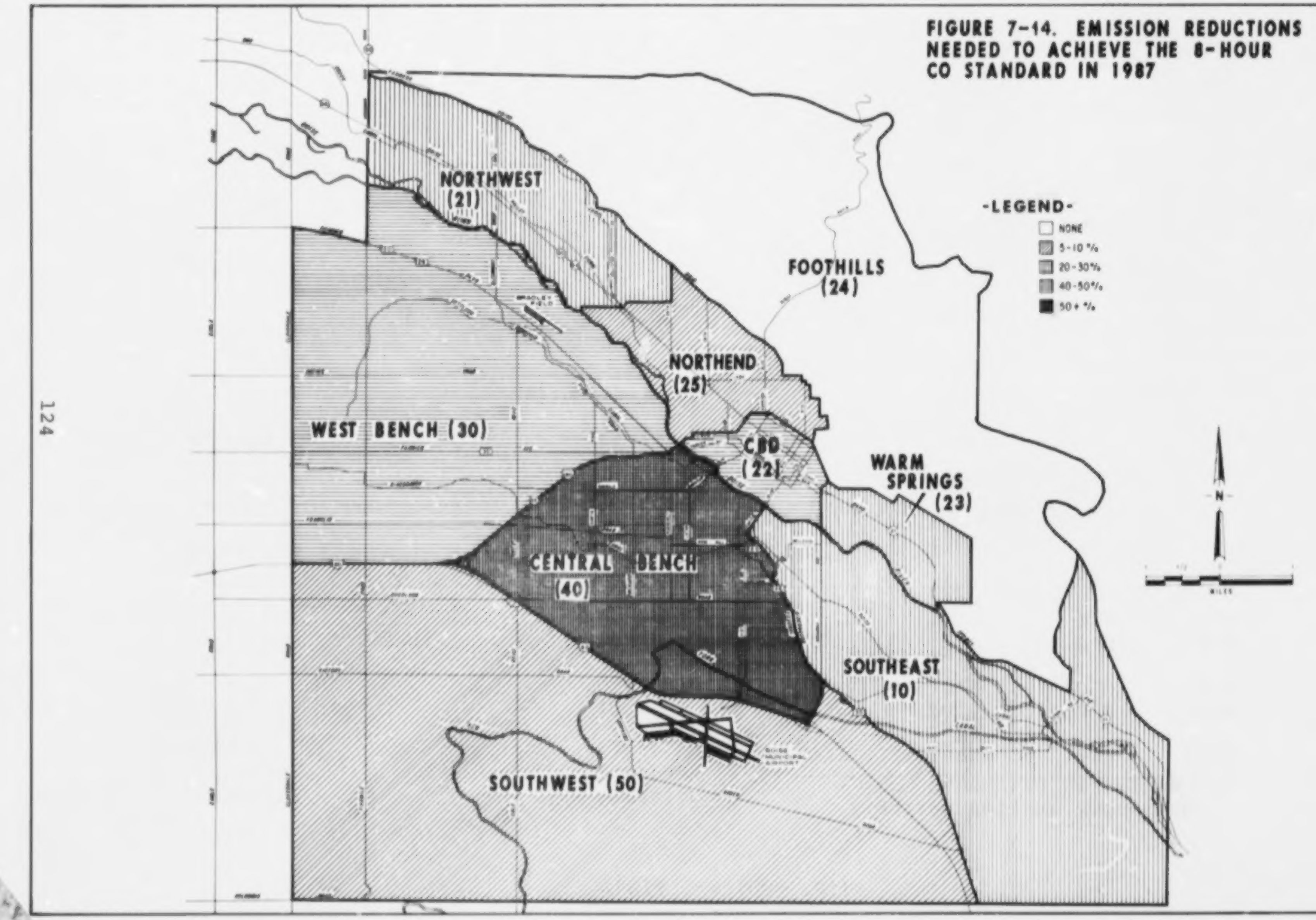

-LEGEND-
☐ NONE
▨ 5-10 %
▨ 20-30%
▨ 40-50%
■ 50+ %
NORTHWEST (21)
FOOTHILLS (24)
NORTHEND (25)
WEST BENCH (30)
CBD (22)
WARM SPRINGS (23)
CENTRAL BENCH (40)
SOUTHEAST (10)
SOUTHWEST (50)
BRADLEY FIELD
BOISE MUNICIPAL AIRPORT
N
MILES

FIGURE 7-14. EMISSION REDUCTIONS NEEDED TO ACHIEVE THE 8-HOUR CO STANDARD IN 1987

FIGURE 7-15. EMISSION REDUCTIONS NEEDED TO ACHIEVE THE 8-HOUR CO STANDARD IN 2000

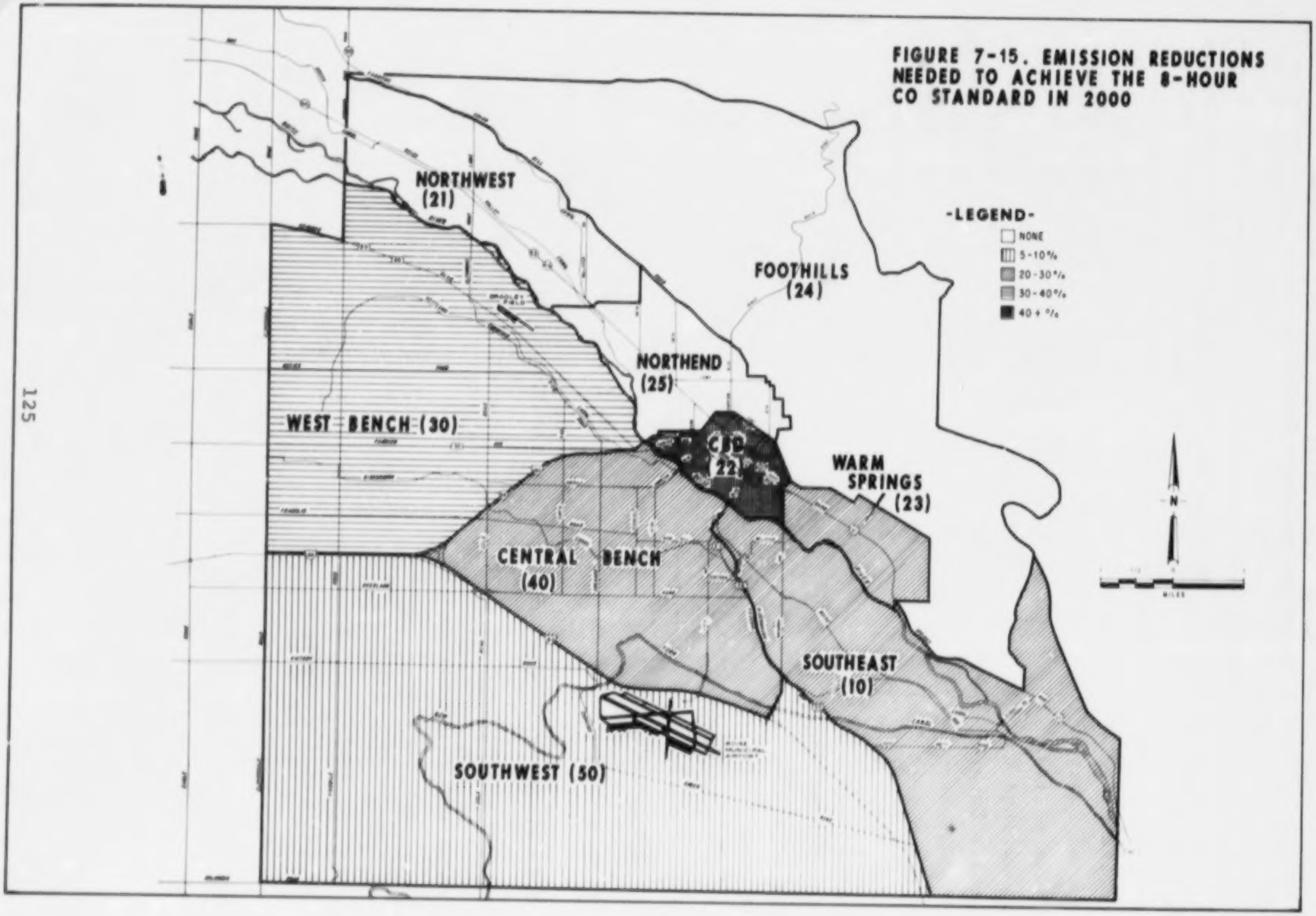

-LEGEND-
☐ NONE
▥ 5-10%
▨ 20-30%
▤ 30-40%
■ 40+%
NORTHWEST (21)
FOOTHILLS (24)
NORTHEND (25)
WEST BENCH (30)
CBD (22)
WARM SPRINGS (23)
CENTRAL BENCH (40)
SOUTHEAST (10)
SOUTHWEST (50)
N
MILES

Table 7-6. Base Year (1977) Air Quality Values Used for Rollback Analyses

Community Planning Area (CPA #)	Background CO (ppm)	Total Ambient CO (ppm)	Emission Source Density Index
Southeast Area (10)	1.0	10.2	156.93
Northwest Subarea (21)	1.0	10.8	166.65
CBD Subarea (22)	2.0	18.3	281.58
Warms Springs Subarea (23)	1.5	12.0	184.72
Foothills Subarea (24)	0.5	4.3	65.62
Northend Subarea (25)	2.0	14.1	216.40
West Bench Area (30)	1.5	18.9	189.63
Central Bench Area (40)	2.0	21.0	210.40
Southwest Area (50)	1.0	10.3	103.29
Meridian Area (60)	0.5	7.5	75.44
Eagle Area (70)	0.5	5.0	76.83
Kuna Area (80)	0.1	1.4	14.39
Rural Ada County Area (90)	0.1	2.9	29.47

NOTES AND SOURCES:

10 am-6 pm Emission Source Density Index (ESDI) values from Table 7-2.

Total ambient CO value for CPA 22 is second high 8-hour average for 1977 as reported by the Ninth Street monitoring station.

Total ambient CO value for CPA 40 is the second high 8-hour average reported by the Idaho Air Quality Bureau special study in 1977-1978 (Idaho Air Quality Bureau 1978).

Ambient CO values for CPAs 10, 21, 23, 24, 25 and 70 calculated from value for CPA 22, based on relative ESDI values.

Ambient CO values for CPAs 30, 50, 60, 80, and 90 calculated from value for CPA 40, based on relative ESDI values.

Background CO values assigned on a judgmental basis following inspection of hourly CO values at the Ninth Street monitoring station and comparison of ESDI values by CPA.

should recognize that the portion of the Southwest area near Broadway Avenue is effectively an extension of the central bench area.

Except for this one situation, the base year CO values assigned in Table 7-6 are in agreement with all available ambient monitoring data.

The analyses presented above have not included the effects of any vehicle inspection and maintenance program for Ada County. If such a program were implemented, projected vehicle emissions would be reduced by about 20-25 percent. This level of emission reduction would still be insufficient to provide for attainment of the 8-hour CO standard in the Central Bench, CBD, West Bench, and Warm Springs areas.

The APA is currently reviewing a number of additional measures which could be implemented to help achieve air quality standards throughout Ada County. Measures currently under consideration include:

- Improved public transit (short-term and long-term programs).
- Carpool/vanpool programs.
- Park and ride facilities.
- Traffic flow improvements through signalization programs, intersection design changes, added road lanes; many specific roadway and intersection improvements are already accounted for in the emission forecasts (see Appendix A).
- Exclusive bus and carpool lanes.
- Parking management programs (controls on the location and duration of on- and off-street parking; parking costs; supporting park and ride programs; facility design and operation; etc.).
- Controls on extended vehicle idling at drive-in facilities.
- Pedestrian malls.
- Improved bicycle facilities.
- Employer actions to support transit, carpool/vanpool programs, bicycle usage, flexible work schedules, etc.

- Planning programs to assist in implementing measures on an individual development project basis.

State Implementation Plan Consistency

Expanded wastewater treatment plant capacity for the City of Boise and the EWSD will accommodate additional urban development. As mentioned previously, the federal Clean Air Act requires that federal funding programs not be used to support projects which are inconsistent with air quality management programs identified in State Implementation Plans. (SIP). The SIP provides the framework for achieving and maintaining federal air quality standards.

SIP revisions for Ada County were submitted to EPA in January and July 1980. In October 1980 EPA approved three aspects of the revised SIP:

- The 1979 transportation control plan portion of the carbon monoxide attainment plan.
- A variance from state indirect source review requirements for the Boise Redevelopment Agency's City Center Project.
- An extension of the CO attainment deadline from December 31, 1982 to December 31, 1987.

EPA also required that an additional SIP revision for Ada County be submitted by July 1, 1981. This SIP revision is to provide commitments to, and a schedule for establishing, an effective vehicle inspection and maintenance program. In addition, the normal updating of the SIP (in 1982) must include revised emission inventories and forecasts, revised analyses of required emission reductions, and a demonstration that "reasonable further progress" is being made toward achieving the federal CO standards. The revised emission inventories and forecasts must incorporate anticipated highway and redevelopment projects.

The emission inventory and forecasting procedures described in Appendix A have been developed to meet the types of requirements noted above. The initial application of these procedures has been discussed previously in this chapter. These emission forecasts were prepared using the same population forecasts which served as a basis for the Boise wastewater treatment facility plan.

The facility plan for the EWSD has been based on a population forecast which is about 30 percent greater than the forecast incorporated into the emission projections. The analysis summarized in Table 7-4, however, indicates that such additional development in the Eagle area would probably not lead to new CO problems in that planning area. This growth increase in the Eagle area would, however, alter traffic projections for roadways in the northwestern portion of the Boise Metropolitan Area. It has not yet been determined whether this would significantly change the air pollution potential and emission reduction requirements listed in Tables 7-4 and 7-5.

Chapter 8

GROUNDWATER RESOURCES

Geology

A brief discussion on geology and groundwater hydrology is presented in this section. More detailed information on these topics is included in groundwater and nonpoint source waste loading reports (H. Esmaili & Associates 1980) available in the EPA office in Boise.

Regional Geology

The regional geology of the Boise Valley is depicted in Figure 8-1A which shows a generalized geologic cross section of the western Snake River Plain. The western Snake River Plain is underlain by a wide, structural trough in the granitic Idaho batholith. This basin contains a section of upper Cenozoic strata several thousand feet thick, composed primarily of sediment and volcanics of the Idaho Group. The stratigraphy of the Idaho Group has been classified by Malde and Powers (1962). Overlying the eroded surface of the Idaho Group is a relatively recent and thin sequence of basalt and sediments into which the Boise Valley has cut. A generalized section of the shallow geology beneath the Boise Valley is shown in Figure 8-1B.

Geology of Study Area

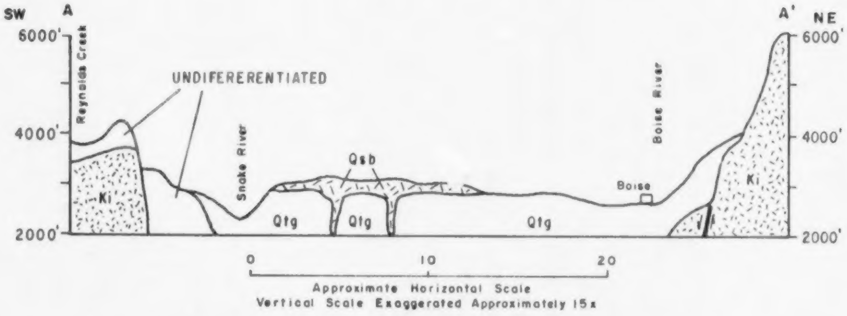
Figure 8-2 is a map of the study area geology as shown by Dion. Following is a brief description of the geologic units exposed in the study area.

The Idaho batholith outcrops at the upper elevations of the Northern Highland and extensively in the Eastern Upland. The granitic batholith is generally regarded as being essentially impermeable, although considerable volumes of water are contained locally and discontinuously in fractures and weathered zones. The fault-bounded batholith plunges deeply beneath the Boise Valley to the southwest, forming the lower limit of the groundwater system.

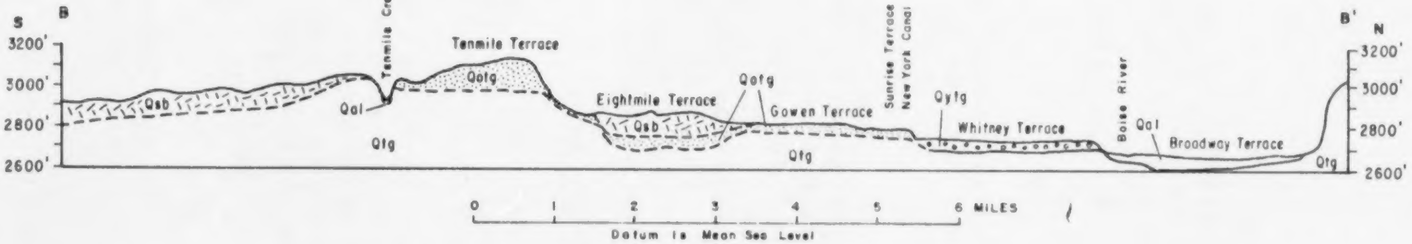
The unit of the Idaho Group which underlies the Boise Valley is the Glenns Ferry Formation of late Pliocene and early Pleistocene age. It has a thickness of about 2,000 feet beneath the Boise Valley, outcrops extensively along the Boise Front, and underlies much of the valley at relatively shallow depths. Its stratigraphic subunits range in texture from clay to fine gravel, include some volcanic ash and lava flows, and are of highly variable thickness and extent. Bedding of the Glenns

FIGURE 8-1

GENERALIZED GEOLOGIC CROSS SECTIONS OF BOISE VALLEY


SW
A
A'
NE
6000'
4000'
2000'
Reynolds Creek
UNDIFERERENTIATED
Snake River
Qsb
Ki
Qtg
Boise
Boise River
0
10
20
Approximate Horizontal Scale
Vertical Scale Exaggerated Approximately 15x

(A) SECTION LOCATION SHOWN IN FIGURE 1
(AFTER MALDE AND POWERS, 1962)
Esmali 1980


S
B
B'
N
3200'
3000'
2800'
2600'
Tenmile Creek
Tenmile Terrace
Qotg
Qsb
Qal
Qtg
Eightmile Terrace
Gowen Terrace
Sunrise Terrace
New York Canal
Qytg
Whitney Terrace
Boise River
Broadway Terrace
0
1
2
3
4
5
6 MILES
Datum is Mean Sea Level

(B) SECTION LOCATION SHOWN IN FIGURE 7
(AFTER NACE Etal, 1957)

- LEGEND -

☐ Qal - ALLUVIUM - CLAY, SILT, SAND & GRAVEL

⁘ Qytg - LATE TERRACE GRAVEL - CHIEFLY MEDIUM-GRAINED TO COARSE GRAVEL W/SOME SAND, SILT & CLAY

▨ Qsb - SNAKE RIVER BASALT - GRAY TO BLACK VESICULAR BASALT

☐ Qotg - EARLY TERRACE GRAVEL - CHIEFLY COARSE GRAVEL W/SOME SAND

☐ Qtg - GLENNS FERRY FORMATION

▒ Ki - GRANITE OF IDAHO BATHOLITH

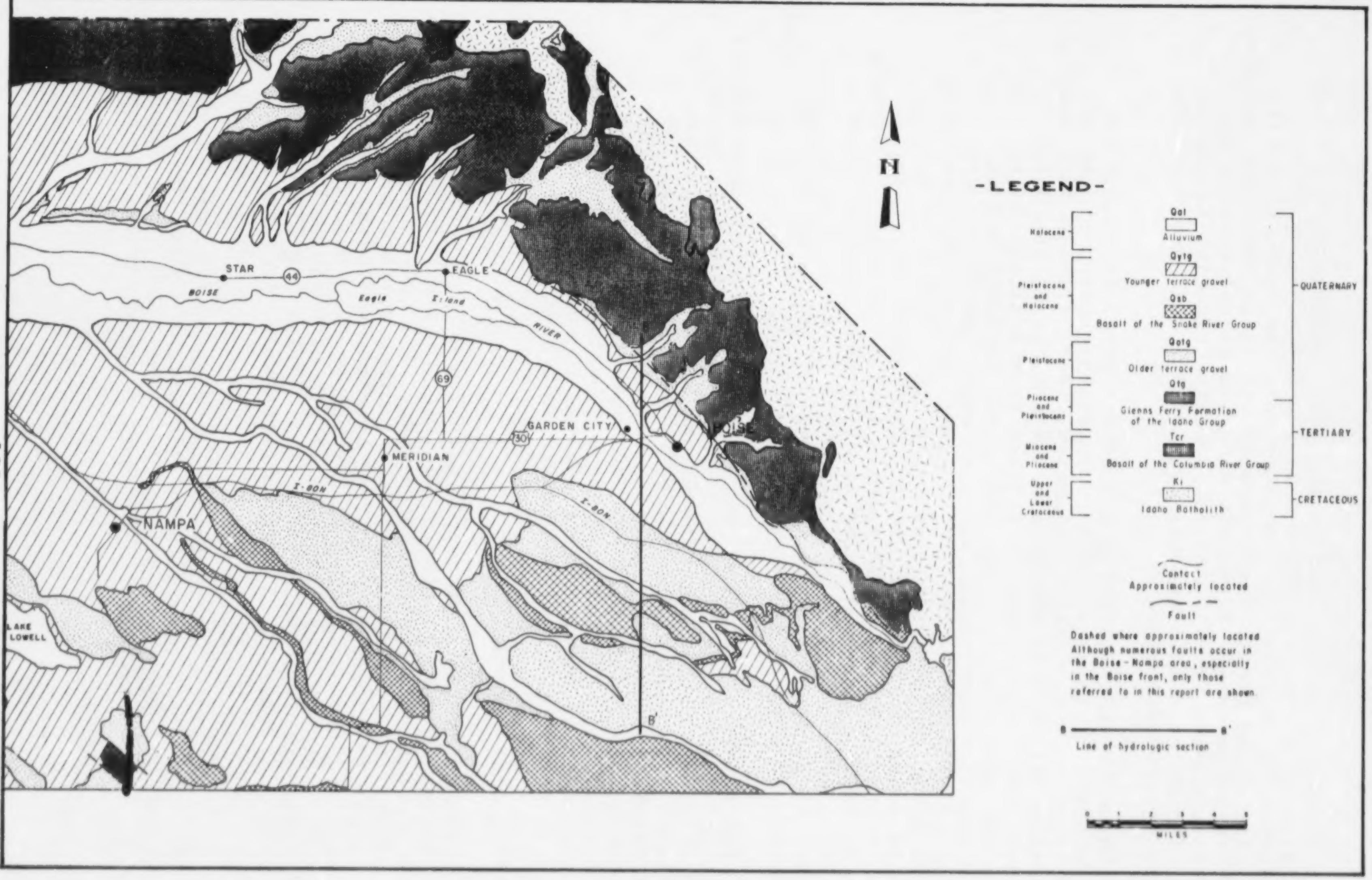

N
STAR
44
EAGLE
BOISE
Eagle
Island
RIVER
69
GARDEN CITY
30
BOISE
MERIDIAN
I-80N
I-80N
NAMPA
LAKE LOWELL
B'
-LEGEND-
Holocene
Pleistocene and Holocene
Pleistocene
Pliocene and Pleistocene
Miocene and Pliocene
Upper and Lower Cretaceous
Qal
Alluvium
Qytg
Younger terrace gravel
Qsb
Basalt of the Snake River Group
Qotg
Older terrace gravel
Qtg
Glenns Ferry Formation of the Idaho Group
Tcr
Basalt of the Columbia River Group
Ki
Idaho Batholith
QUATERNARY
TERTIARY
CRETACEOUS
Contact
Approximately located
Fault
Dashed where approximately located
Although numerous faults occur in the Boise - Nampa area, especially in the Boise front, only those referred to in this report are shown.
B
B'
Line of hydrologic section
0
1
2
3
4
5
MILES

FIGURE 8-2. GENERALIZED GEOLOGIC MAP OF THE BOISE - NAMPA AREA

Ferry Formation is inclined to the west, southwest, and south at angles of up to five degrees in the Boise Valley region. The formation is relatively coarser near the Idaho batholith along the Boise Front; where exposed, it is an important groundwater recharge area. Permeable sand and gravel beds in the saturated Glenns Ferry Formation beneath the Boise Valley act as an important deep, regional aquifer which is semi-confined by the interbedded clay.

Unconformably overlying the Glenns Ferry Formation are the deposits of terrace gravels presently exposed at the surface (Figure 8-1B). Where saturated, these gravels form what is generally referred to as the shallow aquifer of the Boise Valley. Dion subdivided the terrace gravel deposits into older and younger units. The older unit is described as "a thick sheet of unconsolidated silt, sand, and well-sorted gravel of Pleistocene age." This unit is actually a grouping of the deposits forming the valley's upper terraces, namely Tenmile Bench and Meridian, Gowen, and Sunrise terraces. Deposition of these gravels appears to have occurred by streams flowing to the southwest. The older terrace gravels range in thickness from over 100 feet on Tenmile Bench to less than 80 feet on Meridian Terrace and generally less than 50 feet on Gowen and Sunrise terraces.

Pleistocene to Holocene-age basalt flows of the Snake River Group are interbedded within the older terrace gravels as well as occurring directly over the Glenns Ferry Formation. The basalt flow exposed on Eightmile Terrace is as much as 100 feet thick. It overlies approximately 40 feet of the older terrace gravel. Basalt is exposed most extensively in the study area south of Tenmile Bench and Meridian Terrace. Maximum thickness of basalt in these areas is about 150 feet. Where saturated, the basalt has variable aquifer characteristics. Snake River basalt is exposed over nearly the entire Mountain Home Plateau.

Underlying the surface of Whitney and Star terraces are the younger terrace gravels of Pleistocene and Holocene age. These deposits of unconsolidated clay, silt, sand, and gravel, are generally finer grained than the older terrace gravels, and appear to have been deposited by streams flowing to the northwest. This unit forms a thin veneer over basalt of the Snake River Group in a large area south of Meridian Terrace. The younger terrace gravels directly overlie the Glenns Ferry Formation on Whitney and Star terraces where they are up to 50 feet thick.

Broadway Terrace and the tributaries of the Boise River are underlain by unconsolidated Holocene alluvium, the youngest geologic unit in the study area. The alluvium is composed of silt, sand, and coarse, well-sorted gravel; these deposits directly overlie the Glenns Ferry Formation, and have a maximum thickness of 50 feet. Extensive caliche development has occurred in the alluvium and both of the terrace gravel units, as much as 10 feet thick in some areas.

Groundwater Hydrology

The Boise Valley has a unique and plentiful groundwater resource due to the large potential storage capacity of the recent sediments, the annual availability of large volumes of surface water from the Eastern Upland, the distribution of this water for recharge by way of the irrigation system, and the occurrence of 2,000 feet of saturated Glenns Ferry Formation at depth.

Boise Valley Aquifers

Previous studies have described the Boise Valley as generally having two groundwater systems--deep and shallow. The deep groundwater system occurs completely within the Glenns Ferry Formation. The terrace gravels, basalts of the Snake River Group, Holocene alluvium, and upper portions of the Glenns Ferry Formation comprise the shallow system.

The existence of a deep aquifer within the Glenns Ferry Formation that is relatively separate from the shallow, water-table aquifer is made evident by the difference in water levels in wells perforated at varying depths. Water levels in the relatively deep wells of the Boise Valley are observed to be both above and below the level of the shallow water table. The saturated thickness of recent sediments and basalt in the study area range from as little as 10 feet to usually not more than 50 feet.

The boundary between the shallow and deep aquifers within the Glenns Ferry Formation is a gradual and poorly defined one. Nevertheless, the cumulative effect of the occurrence of interbedded fine-grained materials within the Glenns Ferry Formation is a significant reduction in vertical hydraulic conductivity. In other words, groundwater deep within the Glenns Ferry Formation, although in physical continuity with the shallower groundwater, is being recharged and discharged in quite a different manner from the near surface groundwater.

Wells with static water levels characteristically different from those tapping the shallow, water-table aquifer are ordinarily perforated at depths in excess of 300 feet, although similar wells with shallower depths are not uncommon. Artesian or free-flowing wells are generally located on Broadway, Star and Meridian Terraces. Along the Boise River there are free-flowing wells as shallow as 100 feet.

Deep wells exhibiting water levels below the shallow groundwater table occur primarily in the area of the upper terraces where seasonal, irrigation-related recharge has raised the water table to exceptionally high levels.

The saturated shallow aquifer of the Boise Valley formed artificially as the result of agricultural development. Because irrigation with Boise River water is not conducted south and east of the study area, the level of the shallow groundwater body rapidly drops to that of the deep groundwater system. Within the study area, the shallow aquifer contains a principal shallow groundwater system as well as several bodies of perched groundwater.

The shallow groundwater system is made up of five aquifer units: the older terrace gravels, basalts of the Snake River Group, younger terrace gravels, Holocene alluvium, and upper portions of the Glenns Ferry Formation. With the exception of the Glenns Ferry Formation, the components of the shallow groundwater system act as a single hydrologic unit because groundwater flow in this system is not significantly altered at formation interfaces. However, each aquifer unit has a differing range of hydraulic characteristics.

Groundwater Occurrence and Flow

The configuration of the groundwater surface in the Boise Valley is unusually complex, reflecting the high rate of recharge into the shallow aquifer by diverted Boise River irrigation water. The primary factors affecting the flow and occurrence of groundwater in the Boise-Ada County Study Area include: (1) the exceptionally high volume of recharge resulting from leakage along the New York Canal, (2) the near uniform distribution of groundwater recharge elsewhere in the study area due to irrigation and conveyance losses, and (3) the irregular surface of the relatively less permeable Glenns Ferry Formation buried beneath the Boise Valley. Additionally, groundwater is significantly influenced by bodies of buried basalt and the system of artificial drains on the lower terraces.

The configuration of the groundwater-elevation contours in the southwest Boise area is dominated by the influence of recharge from the New York Canal. The highest groundwater elevation in the study area, 2,750 feet above sea level, occurs beneath the New York Canal on Eightmile Terrace. The New York Canal and other irrigation-related sources of recharge to the west combine to produce a broad, high mound of shallow groundwater throughout the Boise Valley. East of the New York Canal, recharging groundwater descends quickly to the level of the deep groundwater system.

Within the Southwest Boise study area, high shallow groundwater levels occur primarily beneath Broadway, Star Whitney, Gowen, Sunrise, and Eightmile terraces. This area is heavily irrigated and criss-crossed with leaky irrigation canals and laterals. The resulting recharge saturates a significant depth of the terrace gravels and alluvium. The unusually intricate groundwater-level contours on Whitney and Broadway terraces indicate the intersection of the seasonal-high water table with the network of drainage canals and laterals. To the extent that these drains are effective, they serve to flatten the peak of the seasonal rise in the shallow, near-surface water table.

The surface of the shallow groundwater system continues beneath Meridian Terrace at elevations similar to the groundwater of the lower terraces but at greater depths with respect to the land surface. Beneath and south of Tenmile Bench and south of Meridian Terrace, the groundwater surface declines to the level of the deep groundwater system.

The manner and extent to which bodies of perched groundwater in the study area become continuous with the relatively deeper groundwater system is unclear. However, zones of perched groundwater appear to roughly coincide with broadly spaced water-level contours of the principal groundwater system in both the upper and lower terrace areas. This suggests an eventual merging of the perched groundwater into the main system.

Groundwater flow. Groundwater flow patterns are distinct for the shallow and deep aquifers. The deep groundwater system flows from its source of recharge along the Boise Front, Boise River, and Boise Valley in general, to the south and southwest where it discharges to the Snake River.

The flow of the Boise Valley shallow groundwater system originates essentially along the high recharge area coinciding with the New York Canal. To the east of the New York Canal, the shallow groundwater descends rapidly to the level of the deep groundwater system. West of the canal, shallow groundwater flow is to the west and northwest, corresponding to the gradient of the eroded surface of the Glenns Ferry Formation as well as the direction of deposition of the terrace gravels.

Groundwater Quality

The quality of Boise Valley water resources ranges from generally good to excellent. Surface water from the Eastern Upland is of highest quality, shallow groundwater and agricultural drain waters have the poorest quality, and deep groundwater is of relatively intermediate quality. The intermixing of surface water and shallow and deep groundwater influences their relative qualities.

The quality of the deep groundwater in the study area is indicated in Table 8-1 which contains the analyses of samples obtained from 17 deep wells of the Boise Water Corporation. When compared to the quality of the Boise River near Boise, the deep well samples are higher in sodium (15-72 mg/l) and dissolved solids (147 mg/l) content suggesting the impact of recharge from irrigation return flows and wastewater disposal operation. Nitrate concentrations (as NO_3-N) range up to 10 mg/l.

Shallow groundwater in the Boise Valley is almost entirely derived from recharge of Boise River water through irrigation and conveyance networks. The waters immediately beneath irrigated agricultural lands have markedly different quality characteristics than the applied water (see the analysis of the Boise River water near Boise). Dissolved solids increase from a range of 43 to 125 mg/l measured in Boise River below Lucky Peak Dam to a range of 100 to 1,240 mg/l measured in shallow wells. Significant increases occur in all constituents, most notably nitrate (up to 88 mg/l as NO_3-N), sodium (up to 184 mg/l), and chloride (up to 86 mg/l). Continual monitoring of these shallow wells would be a prerequisite to establishing the extent of impacts upon groundwater from irrigation, and to establishing specific mitigation measures.

Agricultural drains exhibit water quality similar to shallow groundwater, especially during the nonirrigation season when no dilution occurs with irrigation return flows, as indicated by the November analysis of Fivemile Creek drain at Star Road (Table 8-1). Whereas the effect of agricultural return flow is to dilute the mineral concentration of drain water during the irrigation season, excess applied irrigation water tends to increase mineral concentrations of shallow groundwater due to increased leaching.

Dion (1972) investigated a possible deterioration of shallow groundwater quality due to land use change since the time of the previous study by Nace, West, and Mower (1957). Increasingly widespread use of septic tank wastewater disposal method was suspected to lead to a rise in nitrate concentrations. However, no significant change in shallow groundwater quality was identified. Sampling also did not reveal high concentrations of fecal coliform bacteria in areas of septic tank use nor a buildup of pesticides from agricultural practices.

Other investigators have continued to evaluate the possible changes in shallow groundwater quality in the Boise Valley, again particularly with emphasis on nitrate concentrations. A study by the Central District Health Department (1979) showed that a

Table 8-1. Chemical Analyses of Deep and Shallow Groundwaters, Boise River Water, and Agricultural Drainage Waters in Boise Valley, Idaho (in mg/l unless otherwise indicated)

Chemical Constituents	Deep Groundwater			Shallow Groundwater							
	Boise Water Corporation [a]			A[b]		B[b]		U. S. Bureau of Reclamation			
								Sherman Oaks		Westgate	
	Mean	Variance	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Spec. Cond. (µmhos/cm)	-	-	-	970	250 -5300	320	20 -950	678	255 - 901	748	100 -1240
Diss. Solids	245	98	147 -500	-	-	-	-	425	315 - 577	418	191 - 616
NH_3-N	-	-	-	0.11	0 - 1.6	0.04	0 - 0.75	0.007	0 - 0.1	0.19	0 - 3.3
NO_2-N	-	-	-	0.03	0 - 0.78	0.003	0 - 0.11	0.007	0 - 0.07	0.01	1 - 0.36
NO_3-N	2.1	3.2	0.08- 10	11.2	0.60- 88	5.5	0.40- 12	1.2	0.04- 6.5	5.8	0.01- 24
Organic N	-	-	-	0.72	0 - 2.5	0.50	0 - 1.8	0.27	0.04- 0.88	0.29	0.02- 2.6
Total P	0.09	0.07	0.02- 0.22	0.41	0.06- 1.7	0.41	0.10- 0.95	0.14	0.02- 1.1	0.71	0.14- 6.0
Ca	31	11	18 - 55	-	-	-	-	59.4	42 - 73	59	28 - 85
Mg	11	8.3	2.0 - 32	-	-	-	-	24	17 - 35	25	13 - 36
Na	34	17	15 - 72	-	-	-	-	61	7 - 117	70	4 - 184
K	-	-	-	-	-	-	-	2.0	1.2 - 2.7	3.6	2.0 - 5.1
Cl	9.7	5.7	2.7 - 25	15	0 - 86	4.0	0 - 15	14	2.1 - 38	27	0 - 63
SO_4	28	22	3.2 - 87	-	-	-	-	59	41 - 73	59	28 - 85
F	0.56	0.16	0.39- 0.75	-	-	-	-	0.97	0.82- 1.1	0.68	0.44- 1.1
S_iO_2	8.0	30	17 - 49	-	-	-	-	50	35 - 58	42	30 - 50
Tot. Hardness	121	60	57 -268	-	-	-	-	-	-	-	-
Tot. Alkalinity	284	95	198 -548	-	-	-	-	-	-	-	-
Total Coliform	-	-	-	-	-	-	-	318	2 -10200	72	2 -1020
Fecal Coliform	-	-	-	-	-	-	-	34	0 - 3000	42	0 -6000
Fecal Strep	-	-	-	-	-	-	-	16	0 - 220	35	0 - 800
HCO_3[b]	-	-	-	-	-	-	-	333	273 - 395	175	25 - 331
CO_3[b]	-	-	-	-	-	-	-	0	0 - 0	0	0 - 0

Table 8-1. Cont'd.

Chemical Constituents	Shallow Groundwater					Boise River and Agricultural Drains					
	Boise-Nampa Area[d]		1980[e]			Boise R. near Boise[f]	Boise R. at Star Road[f]	Fivemile Creek at Star Road[f]	Eagle drain near Eagle[f]	Purdum drain near Ada Canyon[g]	Mosey Creek near Ada Canyon[g]
	Mean	Range	Mean	Variance	Range						
Spec. Cond. (µmhos/cm)	596	104-1210	605	193	116-[illegible]	93	126	624	330	460	540
Diss. Solids	-	-	-	-	-	60	219	438	232	-	-
NH_3-N	-	-	-	-	-	-	-	-	-	0.07	0.08
NO_2-N	-	-	-	-	-	-	-	-	-	0.01	0
NO_3-N	2.7	0- 11	3.1	2.2	0.53-11	10.13	-	12.3	-	1.0	3.2
Organic N	-	-	-	-	-	-	-	-	-	0.19	0.36
Total P	0.24	0- 1.8	-	-	-	0.07	-	0.41	-	0.29	0.18
Ca	-	-	-	-	-	12	-	56	-	-	-
Mg	-	-	-	-	-	1.5	-	18	-	-	-
Na	-	-	-	-	-	4.5	-	70	-	-	-
K	-	-	-	-	-	0.8	-	3.5	-	-	-
Cl	16	0- 63	14	9.8	2.4-36	1.5	3.6	14	5.2	8.5	9.4
SO_4	-	-	-	-	-	0	-	62	-	-	-
F	-	-	-	-	-	0.1	-	0.7	-	-	-
SiO_2	-	-	-	-	-	13	-	41	-	-	-
Fecal Coliform	-	-	-	-	-	-	-	50	-	-	-
HCO_3[a]	-	-	-	-	-	52	-	322	-	-	-
CO_3[b]	-	-	-	-	-	0	-	11	-	-	-

Reproduced from best available copy.

Footnotes for Table 8-1

[a] Average analyses from 17 wells in study area drawing from deep groundwater system. Range is for mean ananyses of each well. (Boise Water Corporation, 1980).

[b] Area "A" north of I-80 south of Boise River and over Ada Canyon County line. (9 wells). Area "B" along Mason creek feeder from Hubbard Reservoir Northwest to Ada-Caynon County line. (5 wells). Samples taken monthly 1973-1975 (Lewis et al., 1978)--specially constructed shallow test wells.

[c] Samples taken 7/77 to 9/79 (U. S. Bureau Reclamation, 1979)
Sherman Oaks: 3N1E sec. 23: 5 wells
Westgate: 3N1E sec. 1: 8 wells
--specially constructed shallow test wells.

[d] Samples taken 6, 7, 8/70 from nearly 200 wells in Boise-Nampa area (Ada and Canyon counties) (Dion, 1972)

[e] 21 wells from Idaho Department of Water Resources "Boise Valley Monitoring Newwork" in Ada County study area. Sampled 4/78-9/79 (Leach, 1980).

[f] Boise River and drain. Analyses 11/71 (Thomas and Dion, 1972).

[g] Purdam Drain sampled 1971-1975. Mason Creek sampled 1974-1975. (Lewis et al., 1978).

[h] as $CaCO_3$

74 percent increase in nitrate concentrations had occurred since the time of measurements made by Dion, from an average of 2.02 mg/l NO_3-N in June to August of 1970 to an average of 3.53 mg/l during an undisclosed period in 1979. Preliminary results of the Idaho Department of Water Resources' Boise Valley Monitoring Network (Leach, 1980), however, show this increase to be well within the range of annual fluctuations of nitrate concentrations, commonly fluctuating 3 mg/l and up to 10 mg/l during the year within a given well. Sampling by the U. S. Bureau of Reclamation (1979) indicates annual fluctuations of nitrate concentrations in wells to be commonly over 6 mg/l and as much as 17 mg/l. If the Idaho Department of Water Resources' data of July 1979 is compared to Dion's data of July 1970, little change is observed in any quality parameters (Table 8-1).

Nonpoint Source Waste Loadings of the Groundwater

Summary of Existing Nonpoint Source Discharges to Groundwater in Ada County

Tables 8-2 and 8-3 summarize the estimated nonpoint source loadings for Ada County and the Southwest Study Area, respectively under existing land use conditions. On a countywide basis irrigated agriculture contributes a significant portion of both salt (88 percent) and nitrogen (75 percent) loadings to local groundwaters. The disposal of wastes from feedlots and dairies in the county represents the second major source of mineral contamination, responsible for the generation of about 11 percent of the salt and 20 percent of the total nitrogen discharged annually. On-site waste disposal practices contribute relatively minor quantities of these constituents, amounting to about 4.5 percent for nitrogen and 1 percent for total salts.

In the Southwest Study Area irrigated agriculture is again the major source of salt and nitrogen loadings to the aquifer. In this case irrigation return flows contribute 84 percent of the salts and 58 percent of the total nitrogen discharged from the three sources investigated in this study. On-site waste disposal is responsible for approximately 11 percent of the salt load and 35 percent of the nitrogen load. The two operating dairies generate the remaining 7 percent of the nitrogen and 5 percent of the total salt emissions.

The figures cited in the summary tables are expressed as total mass emissions of pollutants. As such, the values do not reflect differences that may exist in either the concentration or spatial distribution of discharges. These additional considerations may, however, have a substantial effect upon interpretation of the results. For example, highly concentrated wastes from a dairy or feedlot may severely impact

Table 8-2 Summary of Estimated Nitrogen and Total Salt Loadings to Groundwater from Irrigated Croplands, Animal Husbandry and On-site Waste Disposal in Ada County, 1980

Waste Source	Nitrogen tons/yr	Nitrogen %	Salts tons/yr	Salts %
On-site waste disposal	122	4.5	608	1.1
Animal husbandry	547	20.1	6143	11.0
Irrigated cropland	2058	75.4	49334	87.9
Total	2727	100	56085	100

Table 8-3 Summary of Estimated Nitrogen and Salt Loadings to Groundwater Resulting from Irrigated Agriculture, On-site Waste Disposal and Animal Husbandry in the Southwest Study Area, 1980

Waste Source	Nitrogen tons/yr	Nitrogen %	Salts tons/yr	Salts %
On-site waste disposal	46.4	35.3	233	10.7
Animal husbandry	8.8	6.7	109	5.0
Irrigated cropland	76.4	58.0	1828	84.3
Total	131.6	100	2180	100

the quality of a downstream well, while the emission of a far greater total mass of pollutants from cropland may have no measureable impact because of the low initial strength of these return flows and their large areal dispersion. Interpretation of the data presented in this report should, therefore, be made with an awareness of local factors which may have a significant bearing on the relationships between pollutant discharge and groundwater quality.

Impact of On-Site Wastewater Disposal Systems on Groundwater Resources

The Southwest Boise region is a major area of concentration of septic tank leachfield systems in Ada County. This area is expected to remain unsewered for the foreseeable future under established land use plans. The major impact of septic tanks on groundwater resources of the study area would be manifested by high levels of nitrates and possibly total dissolved salts and pathogenic bacteria and viruses in the shallow groundwater bodies.

The presence of nitrate in groundwater is primarily a result of the leaching of fertilizers from the unsaturated soil and nitrification of organic nitrogen contributed by on-site wastewater disposal systems and other sources. Nitrification is an aerobic process dependent on optimal temperature and pH conditions as well as the availability of sufficient oxygen levels. Low concentrations of ammonia-nitrogen in shallow groundwater measured by the Bureau of Reclamation (1979) (generally less than 1.0 mg/l) indicate that nitrification or denitrification of effluent from septic tanks is occurring primarily in the unsaturated zone. Nitrate production in the Boise Valley is probably limited seasonally by the repeated shifts between aerobic and anaerobic conditions due to the fluctuating near-surface water table and by the cold winter-month soil temperatures. The leaching of nitrate into Boise Valley groundwater most likely occurs as the result of heavy rains, spring snow melt and soil thaw, and the application of excess irrigation water. Groundwater recharge from the infiltration of excess irrigation water not only results in the leaching of nitrate but may also significantly dilute nitrate concentrations. Thus, seasonal peaks in groundwater nitrate concentration can be justified theoretically at several times throughout the year depending on a variety of complex environmental conditions.

Mink, et al. (1975) found high levels of ammonia and coliform bacteria in the immediate vicinity of septic tank leachfields constructed in areas with exceptionally high water tables at several study sites in the Boise Valley. The low values of nitrate and nitrite concentrations were believed to be due to the inhibition of the nitrification process by high water table conditions.

Nitrogen emissions in the Boise Valley are most likely increasing as a result of septic tank wastewater disposal practices. However, annual recharge of conveyance losses and excess applied irrigation water has the effect of diluting mineral concentrations to near-normal levels, particularly during the summer and early fall months. Widespread dilution by rather uniformly distributed excess applied irrigation water perhaps explains the lack of well-defined high nitrate zones in the study area. Nitrate levels may remain unchanged until the present practice of applying an average of 3.00 acre-feet per acre per year of excess-irrigation water of low nitrate concentration is significantly altered. It is also probable that there exists a trend of increasing peak-annual nitrate concentrations in groundwater during the non-irrigation season which has gone undetected due to infrequent sampling. An ongoing sampling program undertaken by the Idaho Department of Water Resources will provide the much-needed data in future years.

Groundwater Conditions and Land Use Change

Some of the previous investigations on groundwater conditions in the Boise Valley were aimed at evaluating the impact of land use changes on groundwater level and quality characteristics. Land disposal of domestic and other wastewaters has offset some of the losses in the historical sources of recharge. The decline of irrigated acreage due to suburbanization may have diminished the rate of recharge to the shallow-groundwater body and caused a lowering in the water table. Increasingly widespread use of septic tanks as well as long-term effects of agriculture have been expected to result in groundwater quality degradation.

No significant changes in groundwater quantity and quality conditions were observed in the Boise-Nampa area between 1953 and 1970. The explanation given for a lack of change in shallow groundwater levels were as follows: (1) the magnitude of change in recharge and discharge were relatively small, (2) seasonal and year-to-year fluctuations in water-supply conditions overshadowed any progressive changes in groundwater conditions with time, and (3) small changes in the level of near-surface water tables were moderated by the influence of artificial drains.

Results of the present study tend to indicate the existence of a correlation between the quality of shallow groundwater body and the volume of recharge from irrigation water distribution network and cropped land areas. It appears that recharge from these sources helps to dilute the waste loadings derived from agricultural, residential and commercial land use practices. As additional agricultural lands are converted to nonagricultural uses, the balance between nitrogen and salts loadings and the volume of water recharged to the aquifers will be adversely affected.

Even after suburbanization changes, significant volumes of Boise River irrigation water are being recharged to the groundwater by irrigation of landscaped areas. On the other hand, the continued trend of lining the irrigation canals and laterals will significantly reduce shallow groundwater recharge. Reduced shallow groundwater recharge will undoubtedly result in lower water tables and a shift in the shallow groundwater divide, possibly to the west away from the New York Canal. Lowering of the water table will place groundwater of relatively poorer quality nearer to the zone in which the main water supply wells are located. Additional long-term monitoring of groundwater levels and quality conditions must be carried out to provide adequate data for evaluating the impact of land use changes in the study area.

Mitigation Measures

Under land use Plan C, Rural Life Style, it is expected that the Southwest Boise area will retain its rural characteristics for the foreseeable future. Although some population growth is expected to occur in this area over the next 20 years, it is improbable that the anticipated growth will create a major change in groundwater quality and quantity conditions, barring any significant unforeseen changes in other land use practices or in the irrigation practices of local farmers.

Based on the above discussion, no specific mitigation measure is deemed necessary to alleviate the adverse impact of septic tank discharge on groundwater quality in the study area. Regular monitoring of shallow and deep groundwater quality, preferably on a seasonal basis, should, however, be carried out by an appropriate government agency to provide needed data for future planning and decision-making purposes. Also, adequate controls should be maintained on siting, design, installation and maintenance of septic tank and leachfield systems to assure the protection of public health and safety. A draft document prepared by the Ada Planning Association (APA 1980) contains a comprehensive plan which could provide the basis for developing a workable on-site waste disposal management program.

The elements of the proposed plan are as follows:

- Identification of portions of rural Ada County with high septic system failure rates and comparison of characteristics of such areas to determine causes of the failures.
- Modification of design criteria established by the Central District Health Department to decrease the number of septic system failures due to identified study area characteristics.

- Establishment of a map of rural Ada County that indicates locations of septic system failures. The map would be continually updated to include locations of new failures (map contained in the September 1980 version of the draft APA report [APA 1980]).
- Establishment of a coordinated groundwater monitoring program
- Development of a public education program for residents and commercial establishments
- Development of a voluntary/mandatory maintenance program
- Establish a user fee schedule to fund the program.

Discussions of some of these plan elements, especially the maintenance program, may be found in the September 1980 version of the APA document.

Impacts of Sludge Disposal on Groundwater Resources

Boise Sludge Disposal Site

Land at the Idaho State Penitentiary is considered to be the preferred site for sludge disposal. Soils mapping of the site was conducted by the SCS and soil suitability ratings for sludge application were identified.

The surveys showed that much of the area was underlain by a hardpan layer, ranging from 13-34 inches below the surface. The water table is located below the hardpan layer, at an unknown depth. The SCS survey indicated a depth to groundwater of 72 inches, while other SCS data indicated depths to the seasonal high water table ranging from 24-60 inches (CH2M Hill 1980b). An irrigation well on the site is known to draw water from a depth of 550 feet.

The presence of the hardpan layer between the surface and the groundwater should prevent the movement of leachate downward. Because it is unlikely that the hardpan layer occurs uniformly throughout the area, leachate could travel downward toward the water table wherever cracks or breaks in the hardpan occur.

During the rainy season water may perch above the hardpan and move laterally downslope. Much of the sludge application site is flat or has slopes of 3 percent or less.

The migration of heavy metal ions into the groundwater should not occur so long as the soil and sludge pH is maintained above 6.5 (1977a).

Surface ponding of liquid sludge may increase mosquito populations. Pathogens from the sludge may be transmitted by insect or rodent vectors or by aerosols. Sludge has the potential to cause odors in the area of application.

Sludge has the potential benefit of fertilizing crop lands with a product otherwise buried in landfill or unavailable. This also has potential benefits of possible revenue to the City of Boise through sale of sludge, and of reduced costs to the farmer.

Mitigation Measures

The IDHW has prepared Guidelines for Land Application of Municipal Sewage Sludge which include a number of features designed to protect groundwater resources:

- Site approval requires demonstration that the proposed project will not result in violation of water quality standards applicable to ground and surface water (Idaho Department of Environmental and Community Services, 1973). Factors that will be considered in granting approval include:
  - Proximity to water supply wells.
  - Existing quality and use of groundwater.
  - Geohydrological characteristics of the site; the minimum groundwater depth should not be less than 4 feet.
- Monitoring wells should be installed as indicated by a geohydrological study of the site. The wells and surface streams in the areas should be analyzed for nitrogen, heavy metals, organic and fecal coliforms before sludge disposal at the site and during the life of the project.

Mosquito population may be limited by reducing surface ponding and by using mosquito control measures as necessary.

Pathogens in the sludge are not expected to be significant, however opportunities for exposure to humans should be reduced by limiting access such as by fencing and by "buffer zones". The site is already on prison land and public access reduced accordingly.

Spraying should be avoided on windy days in order to eliminate drift of liquid or aerosols from the application area.

Odors may be mitigated by "buffer zones" between the treated area and human use areas. Additional measures such as working the sludge into the soil may be required as necessary.

Eagle Water and Sewer District Disposal Site

The location for disposal of sludge from the Eagle wastewater facility has not yet been determined. Land application could be utilized with Alternative A - Oxidation Ditch, Alternative C - Land Application by Irrigation, Alternative D - Rapid Infiltration. With Alternative B - Pump to West Boise Treatment Plant, sludge would be disposed of on the Boise application site.

Chapter 9

HYDROLOGY AND SURFACE WATER QUALITY

Existing Conditions

Hydrology

The main watercourse in the study area is the Boise River. The Boise River flows westerly for about 200 miles from its headwaters in the Sawtooth Mountains to its confluence with the Snake River, draining a watershed area of 4,234 square miles (Figure 9-1).

Peak flows in the Boise River occur during the spring snowmelt period between April and June. High flows of short duration occur due to summer thundershowers. Minimum flows occur during the winter months. During the winter when there is no demand for irrigation water, runoff is generally stored in reservoirs.

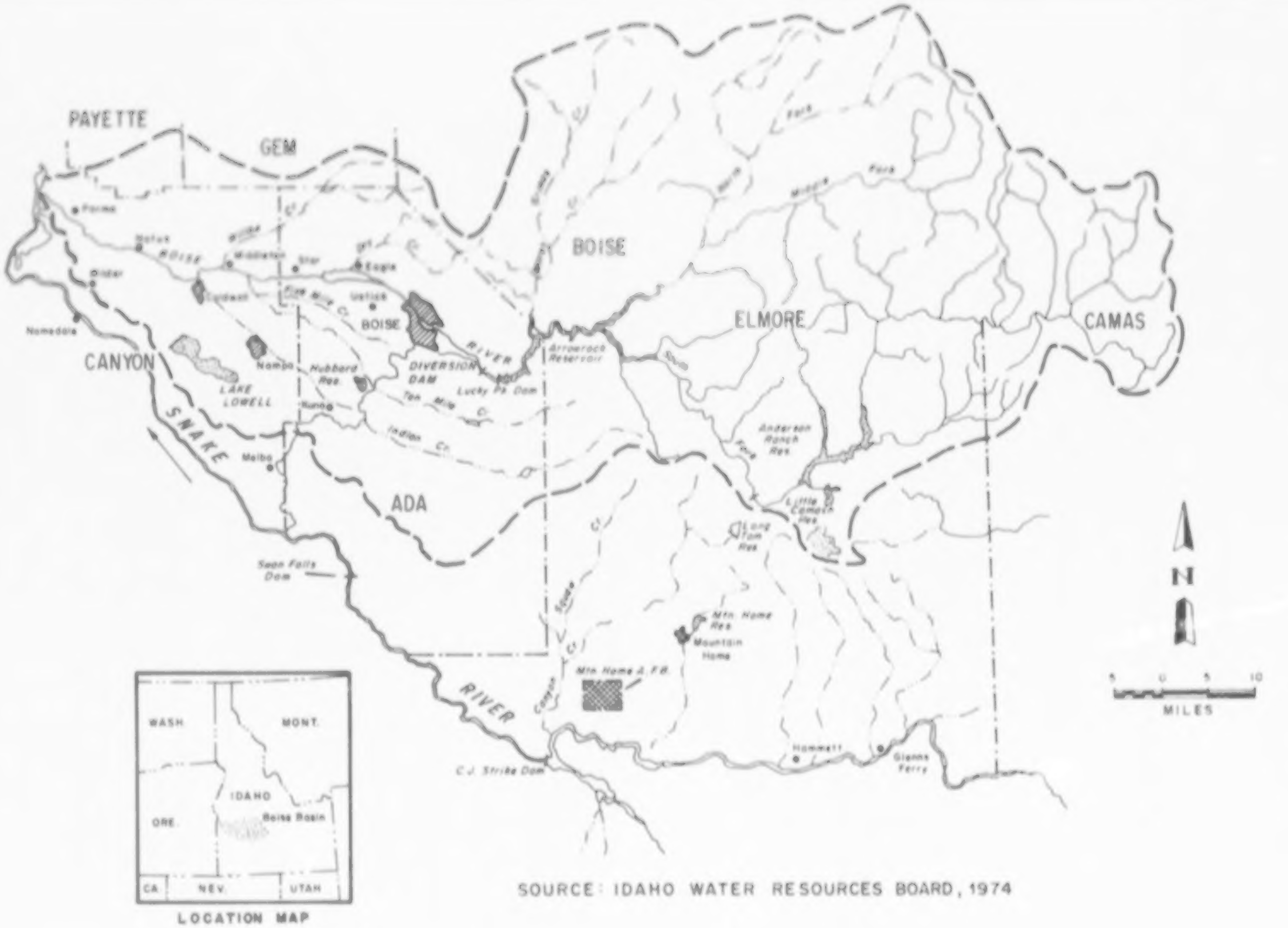
River Regulation. The Boise River is regulated by three on-stream reservoirs (Lucky Peak, Arrowrock, and Anderson Ranch) and one off-stream reservoir (Lake Lowell). Various direct diversions along the Boise River also regulate the flow. The four reservoirs and their storage characteristics are shown in Table 9-1.

Lucky Peak was the most recent dam to be constructed on the Boise River system. Storage capacity in Lucky Peak has been allocated (Table 9-2) to irrigation and to the Idaho Department of Fish and Game for flow maintenance during the nonirrigation season.

Lucky Peak Reservoir is operated in conjunction with Arrowrock and Anderson Ranch to maximize irrigation, flood control, power production and recreation benefits.

The unallocated storage in Lucky Peak (Table 9-2) was set aside for future irrigation needs. Demand for this capacity from newly irrigated lands, however, has not occurred. Irrigation districts have the right to purchase some of the capacity on a year-to-year basis if their supply falls short.

A cooperative study of reservoir operations on the Boise River system is currently being conducted by the Idaho Department


PAYETTE
GEM
BOISE
ELMORE
CAMAS
CANYON
ADA
Parma
Notus
Middleton
Star
Eagle
Caldwell
Greenleaf
Nampa
Meridian
Boise
Kuna
Melba
Nampa
Hubbard Res.
Lake Lowell
Diversion Dam
Lucky Pk. Dam
Arrowrock Reservoir
Boise River
Five Mile Cr.
Ten Mile Cr.
Indian Cr.
Snake
River
Swan Falls Dam
C.J. Strike Dam
Anderson Ranch Res.
Little Camas Res.
Long Tom Res.
Mtn. Home Res.
Mountain Home
Mtn. Home A.F.B.
Canyon Cr.
Hammett
Glenns Ferry
South Fork
N
5
0
5
10
MILES
WASH.
MONT.
IDAHO
Boise Basin
ORE.
CA.
NEV.
UTAH
LOCATION MAP

SOURCE: IDAHO WATER RESOURCES BOARD, 1974

FIGURE 9-1. BOISE RIVER WATERSHED

Table 9-1. Principal Reservoirs in the Boise River Basin

Reservoir	Capacity (AF)[1] Gross	Active	Year Constructed Agency	Water Source
Anderson	493,200	423,200	1945-USBR[2]	South Fork, Boise River
Arrowrock	286,600	286,600	1915; raised 5 ft. in 1937- USBR	Boise River
Lucky Peak	307,040	266,200[4]	1954-USCE	Boise River
Lake Lowell	190,100	169,000	1908-USBR	New York Canal (Boise River)

NOTES:

[1] AF: acre-feet.
[2] USBR: U. S. Bureau of Reclamation (now the U. S. Water and Power Resource Service).
[3] USCE: U. S. Army Corps of Engineers.
[4] 278,200 AF available (top 4 feet of storage not used).

SOURCE CH2M Hill 1980b.

Table 9-2. Lucky Peak Reservoir Storage Allocation

Use	Total Capacity (AF)	Usable Capacity (AF)
Irrigation	111,750	107,200
Idaho Department of Fish and Game	50,000	47,800
Unallocated	116,250	111,200
TOTAL	278,000	266,200

SOURCE: CH2M Hill 1980b.

of Water Resources, the U. S. Army Corps of Engineers, and the U. S. Water and Power Resources Service (WPRS). A second study, which will assess the uncontracted capacity in Lucky Peak Reservoir, is being conducted by WPRS (CH2M Hill 1980b). The results of these studies may have significant bearing on the Boise River flows available to dilute Boise sewage effluent. The WPRS study is not expected to be complete until 1982.

Flooding. Flooding has historically occurred on the Boise River during spring runoff and thunderstorms. The frequency of flooding, however, has decreased as the degree of river regulation has increased. The highest recorded flood flow occurred in 1896 when 35,500 cubic feet per second (cfs) was measured at Boise. The largest rainfall-related flood was recorded in 1909 at 15,200 cfs.

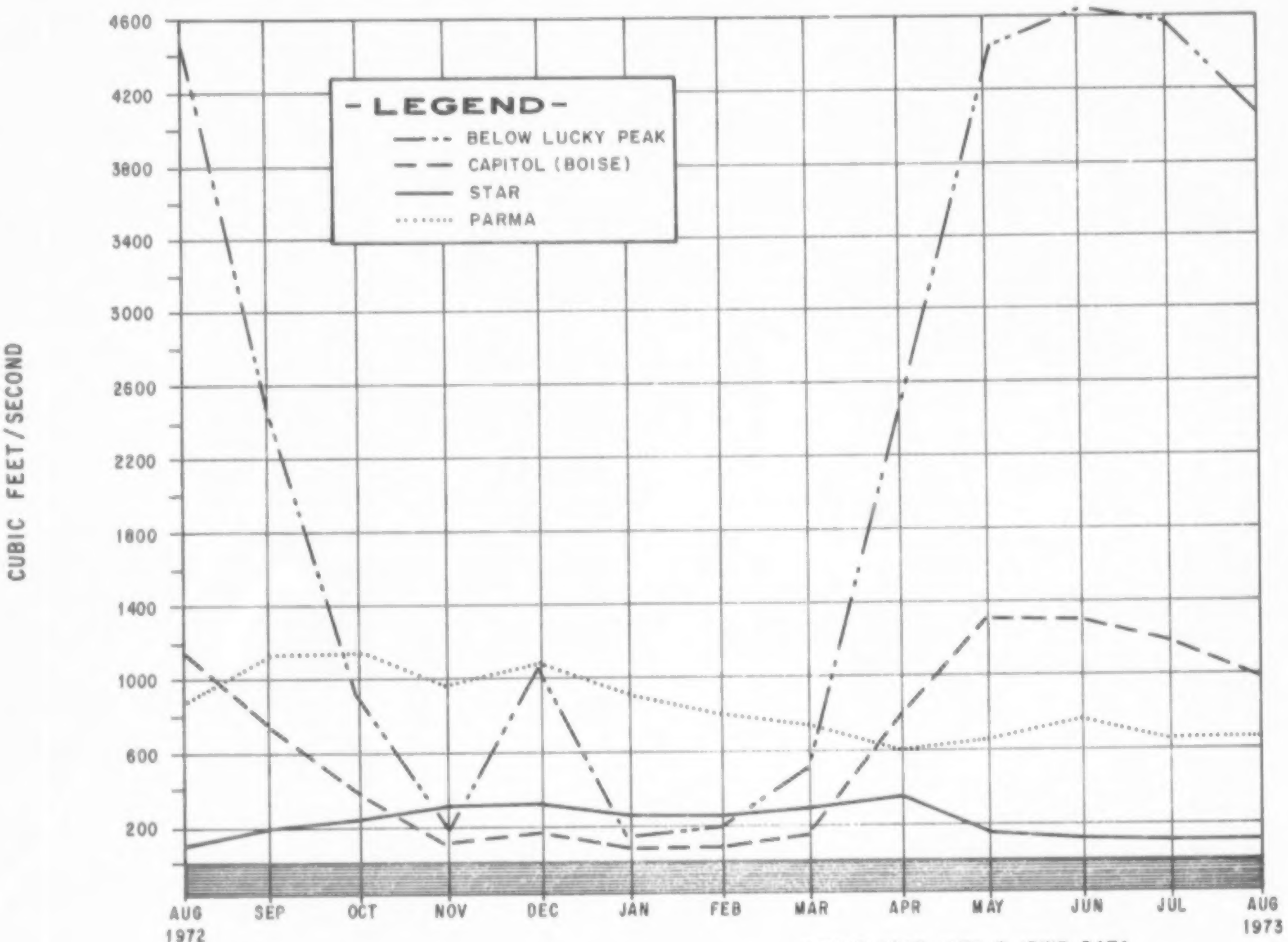
The Boise River is currently regulated so as not to exceed a flow of 6,500 cfs in Boise. Flooding occurs within the Boise Metropolitan area at flows exceeding channel capacity of 6,500 cfs. Major flooding generally occurs at flows over 10,000 cfs.

Flood control operations at the reservoirs begin in January and usually continue through May, when storage begins in the empty flood control capacity.

Irrigation. The greatest use of surface water in the Boise River watershed is for irrigation. Irrigation in the Boise Valley dates from the late 1800s. Currently, there are 31 major irrigation diversions from the Boise River. These canals have a total capacity of 6,700 cfs (Idaho Water Resources Board [IWRB] 1974). A transbasin diversion from the South Fork of the Boise River occurs at Little Camas Reservoir. This diversion, averaging 10,500 acre-feet per year, is used for irrigation of lands in the Mountain Home Irrigation District, outside of the Boise River watershed.

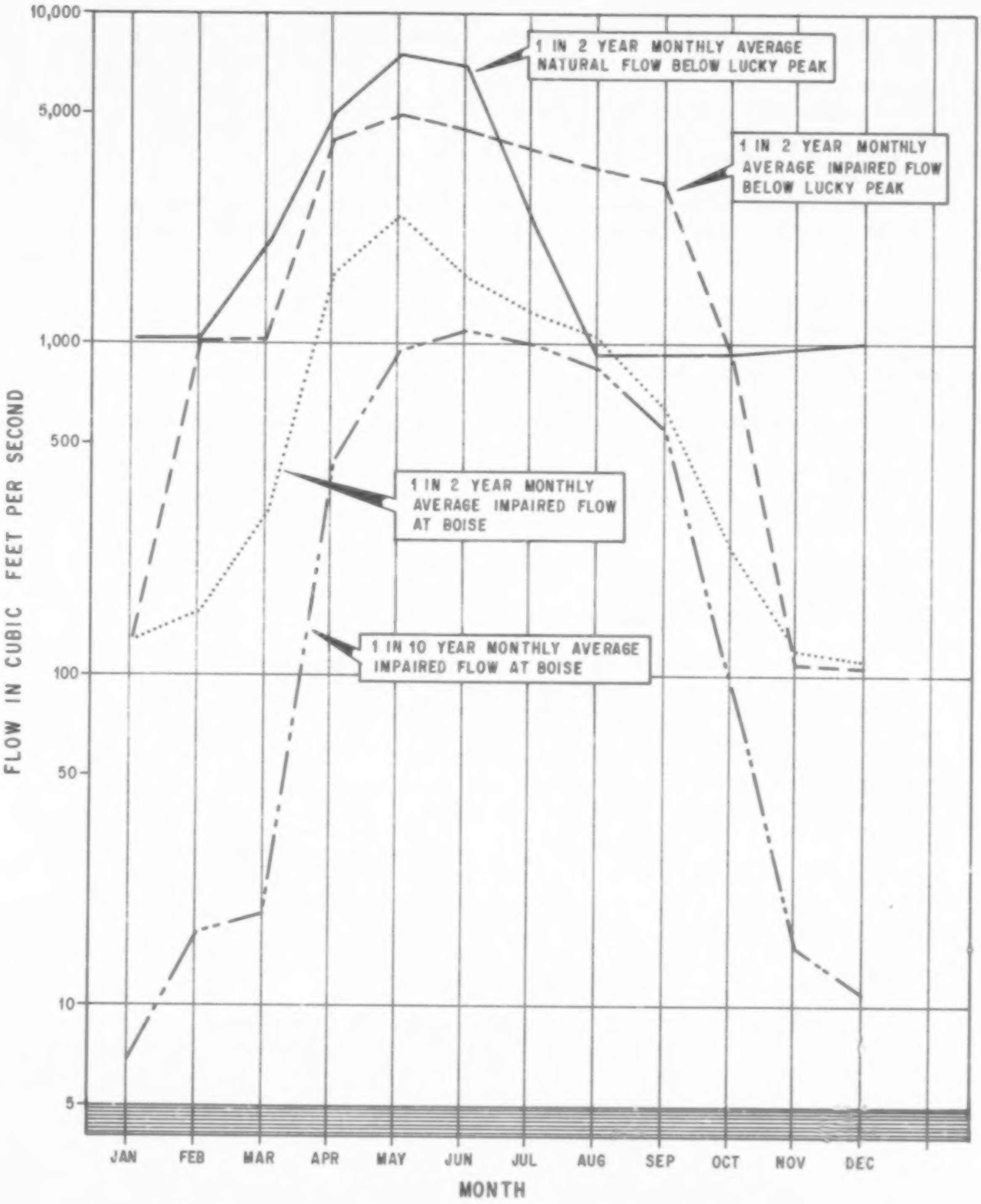
Flow Conditions. The flows of the Boise River vary significantly between Lucky Peak Dam and the mouth of the river. Hydrographs representing the flow in the Boise River at various locations are shown in Figure 9-2. During the irrigation season significant flow reductions occur between Lucky Peak Dam and Capitol Street Bridge. Between Capitol Street and Star, the flow is reduced even more due to additional diversions. At Parma, return flows have added to the river and increased the flow.

Calculated natural annual flow (with no dams or diversions) and impaired flow (with existing dams and diversions) below Lucky Peak Reservoir, and 1-in-2 year and 1-in-10 year flows at Boise are shown in Figure 9-3. As a result of regulation and diversion, flows are much lower than natural, especially



SOURC: ACOG 1975 & IDWR DATA

FIGURE 9-2. AVERAGE MONTHLY FLOW AT FOUR LOCATIONS ON BOISE RIVER - (AUGUST 1972 THROUGH JULY 1973)



(USGS DATA, U.S. ARMY CORPS OF ENGINEERS DATA) YEARS OF RECORD 1955-1979

FIGURE 9-3. HYDROLOGIC CHARACTERISTICS OF THE BOISE RIVER BELOW LUCKY PEAK DAM AND AT BOISE

during the nonirrigation season (November-March). The 1-in-10 year low flow at Boise during the nonirrigation season is lower than the 1-in-2 year flow by about a factor of 10, while the difference during the irrigation season is much less. The greater difference during the nonirrigation season is partially due to periodic maintenance shutdowns of the Lucky Peak outlet structure. The periodic shutdowns will probably cease when the hydropower facilities proposed by the Boise Project Board of Control are installed in Lucky Peak Dam.

Regulation of the Boise River by all the dams now in place began in 1955, but the operation of those reservoirs, especially Lucky Peak, has changed recently. The current regulation scheme, begun in 1977, balances water allocations so that any shortages in storage in Lucky Peak Reservoir will be taken in the unallocated storage rather than the allocated irrigation or fish and game storage. That is, if Lucky Peak fails to fill, the deficit will be assigned to the unallocated capacity first. Past practice was to distribute the shortfall over all three storages.

Existing Treatment Plant Flows. There are three wastewater treatment plants in the Boise Metropolitan area. There are also treatment plants at Eagle and Caldwell.

Lander Street and West Boise sewage treatments plants serve the Boise Metropolitan area and discharge directly to the Boise River, adding to river flows. Lander Street has a design flow of 15 million gallons per day (MGD) (22.5 cfs) and West Boise is designed for 6.3 MGD (9.5 cfs). Gowen Field, located at the airport, is designed for 0.5 MGD and discharges to land. The Lander Street plant is operating at capacity. The West Boise plant is overloaded hydraulically in summer due to excess infiltration/inflow (CH2M Hill 1980c). The Eagle plant has a design capacity of 0.3 MGD for summer and 0.5 MGD for winter (J-U-B Engineers 1980).

Water Quality

Water Quality Standards. Designated beneficial uses, water quality standards, and wastewater treatment requirements in Idaho are promulgated by the State of Idaho in Title 1, Chapter 2 of the Rules and Regulations of the Idaho Department of Health and Welfare. These rules and regulations are formulated by department staff, and adopted by the Board of Health and Welfare pursuant to authority vested by the Idaho code. Within 1 year of adoption by the board, the Idaho State Legislature may modify or reject new or revised rules and regulations by concurrent (majority) resolution of both houses.

The EPA may approve standards set by the state, or not approve them and promulgate its own standards. EPA formulates National Pollutant Discharge Elimination System (NPDES) permit requirements (i.e., waste discharge permit requirements) to comply with state standards it approves, or its own standards. EPA may take enforcement action against dischargers in violation of NPDES permit requirements.

Idaho Designated Beneficial Uses. Beneficial uses designated for the Boise River basin below Lucky Peak Dam are shown in Table 9-3. Above river mile 50 (the location of the Lander Street sewage treatment plant discharge) the river is protected for all uses, and is designated a Special Resource Water. Below river mile 50, domestic water supply and special resource water designations are dropped.

In addition to protection of specifically listed designated beneficial uses in specific waters, the rules and regulations state that protected uses are not limited to those listed uses; and that "in all cases, existing beneficial uses of the waters of the state shall be protected" (Section 1-2050.026).

Idaho Standards for Protection of Beneficial Uses. The water quality standards for protection of beneficial uses are shown in Table 9-4. The standards for a given use apply to waters protected for that use, unless superseded elsewhere in the regulations. For example, the dissolved oxygen standard for salmonid spawning in the Boise River below river mile 50 (the Lander Street discharge) is lowered to 6 mg/l or 75 percent of saturation, whichever is greater, by Section 1-2278 of the regulations.

In late March 1980, the Idaho legislature revised the un-ionized ammonia standard for Indian Creek below Nampa to 1.0 mg/l. The legislature has also lowered the dissolved oxygen standards below reservoirs from 6 mg/l to 5 mg/l.

Water Quality Conditions. The water quality conditions of the Boise River and its tributaries have been extensively studied since the early 1970s. Sampling has included dissolved and suspended constituents, bacteria and the biotic communities. Sampling agencies have included:

- o Ada Planning Association
- o U. S. Water and Power Resources Service
- o City of Boise
- o Boise State University
- o Idaho Department of Health and Welfare
- o U. S. Army Corps of Engineers
- o Idaho Department of Fish and Game
- o U. S. Environmental Protection Agency
- o U. S. Fish and Wildlife Service

Table 9-3. Protected Beneficial Uses of Waters of the Boise River Basin Below Lucky Peak Dam

	Beneficial Uses							
River Reach	Domestic Water Supply	Agricultural Water Supply	Cold Water Biota	Warm Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation	Special Resource Water
Boise River - Lucky Peak to River Mile 50 (through Veterans State Park)	●	●	●		●[1]	●	●	●
Boise River - River Mile 50 (Veterans State Park) to Caldwell		●	●		*	●	●	
Ten Mile Creek		●	*		*		●	
Five Mile Creek		●	*		*		●	
Boise River - Caldwell to mouth		●	*		*	●	●	
Indian Creek - Above Sugar Avenue, Nampa		●	●		●	●	●	
Indian Creek - Below Sugar Avenue, Nampa		●	*			*	●	

● Protected for present use.
* Protected for future use.
[1] Except Lucky Peak Dam to Diversion Dam.
SOURCE: Title 1, Chapter 2, Rules and Regulations of the Idaho Department of Health and Welfare.

Table 9-4. Summary of Idaho State Water Quality Standards For Designated Beneficial Uses

Use	Parameter	Standard
Primary Contact Recreation	Fecal coliform (May 1-Sept. 30)	≤500/100 ml any sample ≤50/100 ml 30-day geometric mean
Secondary Contact Recreation	Fecal coliform	≤800/100 ml any sample ≤200/100 30-day geometric mean
Cold Water Biota	Dissolved oxygen	>6 mg/l at all times
	pH	6.5-9.0
	Temperature	<22°C instantaneous; <19°C daily average
	Total Dissolved Gases	<110 percent of saturation
	Un-ionized NH_3	<0.04 mg/l 30-day mean if water quality characteristics near optimal, <0.02 mg/l otherwise
Salmonid Spawning (During Spawning and Incubation)	Dissolved oxygen	>6 mg/l or 90 percent saturation, whichever greate
	pH	6.5-9.0
	Temperature	<13°C instantaneous; <9°C daily average
	Total Dissolved Gases	<110 percent of saturation
	Un-ionized NH_3	<0.04 mg/l 30-day mean if water quality characteristics near optimal; <0.02 mg/l otherwise
Domestic Water Supply	Arsenic	<0.05 mg/l
	Barium	<1 mg/l
	Cadmium	<0.01 mg/l
	Chromium	<0.05 mg/l
	Cyanide	<0.2 mg/l
	Fluoride	<2.4 mg/l (≤12°C) <2.2 mg/l (12.1-14.6°C) <2.0 mg/l (14.7-17.6°C) <1.8 mg/l (17.7-21.4°C) <1.6 mg/l (21.5-26.1°C) <1.4 mg/l (26.3-32.5°C)
	Lead	<0.05 mg/l
	Mercury	<0.002 mg/l
	Nitrate	<10.0 mg/l as N
	Selenium	<0.01 mg/l
	Silver	<0.05 mg/l
	Endrin	<0.0002 mg/l
	Lindane	<0.004 mg/l
	Methoxychlor	<0.1 mg/l
	Toxaphene	<0.005 mg/l
	2,4 D	<0.1 mg/l
	2,4,5, TP with Silvex	<0.01 mg/l

NOTES:

For more detailed information concerning standards and sampling requirements, consult the rules and regulations.

SOURCE: Section 1-2250, Rules and Regulations of the Idaho Department of Health and Welfare.

Water quality conditions are governed by various point source discharges, by agricultural return flows and by river flow available to dilute pollutant loads. During the winter nonirrigation season, flow in the river below Lucky Peak is often insufficient to provide adequate dilution of wastes discharged to the river. In the irrigation season, diversion of flow for agricultural usage may create low flow conditions in the vicinity of Star. Below Star flows again increase due to agricultural return flows.

Water quality conditions for the Boise River are given in Table 9-5. Generally, the water quality of the Boise River worsens downstream of Boise. This degrading condition is due to the various point and nonpoint source pollutant loads entering the river. Several industrial discharges, in addition to the municipal waste load, add significant pollutant loads. Agricultural drains also account for a portion of the total pollutant load in the river.

Temperature. The temperature of the Boise River increases in downstream direction and is especially elevated during the summer months. An increase in water temperature occurs between Caldwell and Parma stations, which have average summer temperatures of 14.9°C and 17.4°C, respectively. The flows in this reach are governed by agricultural return flows.

Dissolved Oxygen. Adequate levels of dissolved oxygen are necessary for the survival of fish and other aquatic organisms. STORET (EPA computerized data base) data show that dissolved oxygen concentrations in the Boise River decrease in a downstream direction during the summer months. During the winter the average dissolved oxygen is relatively stable, with only a slight decrease downstream. The agricultural drains usually have lower dissolved oxygen concentrations than the Boise River.

Ada Council of Governments (ACOG 1975d) found dissolved oxygen concentrations to decrease in a downstream direction. The concentrations, however, were determined to be within acceptable limits for the beneficial uses along the river.

At Star, EPA (1971a) found minimum percentage dissolved oxygen saturation. Star is the point in the river where flows are greatly reduced, often approaching a no-flow condition.

Nutrients. The major nutrients used by algae and other aquatic plants include various nitrogen and phosphorus compounds. Nitrogen released in sewage effluent is primarily in the form of organic nitrogen or ammonia. Various bacteria decompose the organic nitrogen to ammonia, while other bacteria

Table 9-5. Average Water Quality Conditions of the Boise River Main Stem

	Boise River Below Lucky Peak		Boise River Below Barber Dam		Boise River At Glenwood Bridge		Boise River At Star		Boise River at Highway 30 Bridge, Caldwell	
	S*	W*	S	W	S	W	S	W	S	W
pH (units)	7.3	7.3	7.2	7.3	7.4	7.5	7.4	7.5	7.7	7.8
Temperature (°C)	11.9	7.3	12.0	7.2	12.7	7.3	14.3	7.3	14.9	7.5
DO (mg/1)	10.1	11.6	9.6	11.8	9.4	11.2	9.5	11.1	8.7	11.4
BOD (mg/1)	1.1	1.2	1.2	1.1	1.4	2.7	1.9	2.5	1.8	2.2
Ammonia -N (mg/1)	.02	.02	.02	.02	.20	.43	.04	.20	.03	.10
Nitrite -N (mg/1)	< .01	.01	< .01	< .01	.02	.03	.02	.03	.02	.05
Nitrate -N (mg/1)	.12	.23	.12	.16	.19	.32	.37	1.07	.86	1.60
Organic Nitrogen -N (mg/1)	.28	.26	.28	.25	.29	.36	.38	.41	.50	.43
Total Phosphorus -P (mg/1)	.04	.06	.04	.05	.19	.31	.17	.39	.26	.33
Ortho Phosphorus -P (mg/1)	.01	.03	.01	.02	.14	.23	.12	.30	.15	.22

*S = summer, April-September
W = winter, October-March

SOURCE: STORET (data collected by U. S. Water and Power Resources Service, mainly from 1977-1979).

convert ammonia to nitrite and nitrate. Algae can use ammonia, nitrite, or nitrate; the nitrate form, however, is most readily used. While ammonia and nitrite can serve as plant nutrients, these two forms of nitrogen can also be toxic to fish.

Very little ammonia is found in the river above Boise. Ammonia concentrations reach a maximum (0.43 mg/l in winter) at Glenwood Bridge. The increase is due to wasteloads, especially treated municipal sewage, entering at Boise. Below Boise, the river shows improvement with the ammonia concentrations decreasing (EPA 1971a, ACOG 1975d). Nitrate increases in a downstream direction, with the highest concentrations found at Parma. The large nitrate concentration at Parma is due not only to upstream discharges of ammonia, organic nitrogen and nitrite from wastewater effluent, but also due to runoff from agricultural lands.

Total phosphate and orthophosphate increase in a downstream direction. Orthophosphate averages 0.01 mg/l below Lucky Peak and 0.30 mg/l at Star. The increase is primarily in response to runoff from agricultural acreage or accretions from groundwater recharge from irrigation and treated sewage effluent.

Biochemical Oxygen Demand. Biochemical oxygen demand (BOD) is an index of the oxygen-consuming organic substances in water. High BOD levels can deplete the dissolved oxygen necessary for survival of fish and other aquatic organisms. The BOD in the Boise River does not show large increases over upstream concentrations until the station at Parma. During summer conditions, organic materials are readily oxidized. Consequently, the effect of oxidizing BOD loads shows up at lower oxygen concentrations rather than increased BOD concentrations. In the winter, colder temperatures inhibit the organisms that oxidize organic material, and BOD increases at the downstream stations.

Present Effluent Effects. Water quality data are collected above and below both the Lander Street and West Boise outfalls. Summer average data are shown in Table 9-6. Increases in ammonia and phosphate occur below the Lander Street outfall, while dissolved oxygen concentrations decrease. Temperatures increase slightly. The change in river quality due to the West Boise discharge is not as pronounced for many constituents as at the Lander Street plant. Phosphate levels show the greatest relative increase.

The Eagle wastewater facilities have met NPDES permit requirements with the exception of suspended solids during algal blooms in the treatment ponds (J-U-B Engineers 1980).

Table 9-6. Average Water Quality Data Above and Below Lander Street and West Boise Sewage Treatment Plant Outfalls, October 1975-April 1980

		Above Lander St.	Below Lander St.	Above W. Boise	Below W. Boise
Temp. °C	I	10.6	10.8	11.8	11.5
	N	6.0	6.7	6.4	6.6
pH	I	7.4	7.4	7.5	7.5
	N	7.5	7.5	7.6	7.6
Dissolved O_2 mg/l	I	9.9	9.3	9.0	8.9
	N	10.2	9.5	8.7	9.5
NH_3-N mg/l	I	0.12	0.34	0.12	0.09
	N	0.22	0.94	0.50	0.43
PO_4 mg/l	I	0.22	0.47	.34	.43
	N	0.23	0.85	.72	1.04

NOTES:

I = Irrigation season (April-September)
N = Nonirrigation season (October-March)

SOURCE: City of Boise (Lander Street Wastewater Treatment Plant file data).

Impact Analysis

Hydrologic Changes

The Lander Street and West Boise sewage treatment plants are projected to treat and dispose of an annual average of 34.9 MGD of wastewater by the year 2000. The projected division of flow between the two plants is projected to be as follows (including the Southwest Area):

Flow	Lander St. (MGD)	West Boise (MGD)	Total (MGD)
Irrigation season	11.7	27.7	39.4
Nonirrigation season	9.0	21.2	30.2

SOURCE: CH2M Hill 1980c.

The effluents from both treatment plants will discharge to the Boise River, adding to the existing river flows. Table 9-7 shows low flow conditions projected for the Boise River under current reservoir management procedures; projected sewage discharges are included in these values. The Eagle effluent (1.0-1.3 MGD) will not significantly affect these values.

An indirect impact on flow in the Boise River in the future will be increased storm peak flows due to increased stormwater runoff. Increased stormwater runoff is not directly caused by the treatment plants; it is caused by growth of population, urbanization, and impervious surface that follow expansion of the plant and sewer service. This secondary impact will increase the storm peak flows in storm drain channels and possibly the Boise River.

Water Quality Changes

The facilities planning has been conducted assuming a 1-in-10 year low flow of 80 cfs below Lucky Peak. As discussed in the facilities plan (CH2M Hill 1980c), this flow value assumes that reservoirs on the Boise River will be operated in the same manner as they have been for the past 2 years. The historical 1-in-10 year low flow, which is normally the design parameter for sewage treatment facilities, is 0 cfs below Lucky Peak. This is due to shutdown of the reservoir outlet for maintenance. This should no longer be a problem when the Boise Project Board of Control installs a second outlet for its hydropower facilities.

Table 9-7. Projected Fall and Winter Low Flow Conditions in the Boise River

Season	Percent Probability that Flow will be Equalled or Exceeded	Return Period (years)	Flow Below Lucky Peak (cfs)	Flow Below W. Boise Assuming High or Low Groundwater Inflows (cfs)	
				High[1]	Low[2]
Fall conditions	16	6	225	297	285
	11	9	100	172	160
	10	10	80	152	140
	9	11	70	142	130
	8	13	60	132	120
Winter conditions	10	6	150	221	203
	12	8	100	172	153
	11	9	90	162	143
	10	10	80	152	133
	9	11	65	137	118
	8	13	50	122	103

NOTES:

[1] High groundwater inflow = 25 cfs. both fall and winter.
[2] Low groundwater inflow = 13 cfs in fall, 6 cfs in winter.

SOURCE: Barker, CH2M Hill pers. comm.

However, it is a problem to assure that there will actually be a full 80 cfs available as a 1-in-10 year low flow. Much of the water released in the nonirrigation season from Lucky Peak Dam comes from the unallocated storage. This water has been appropriated by the U. S. Water and Power Resources Service, and is subject to sale to irrigators. There appears to be no demand for this water on irrigable lands in the Boise Valley. There may be a future demand in the Mountain Home area, and the water may go there via transbasin diversion.

The City of Boise and the facilities planners are continuing efforts to assure the minimum flows at least through the life of the project (year 2000). These efforts will probably not be resolved until the U. S. Water and Power Resources Service completes its operations studies of the Boise River system sometime in 1982. If flow assurance is obtained, then the Lander Street plant will be able to operate without violating water quality standards at the 1-in-10 year flow. At less frequent flows (1-in-11 years, 1-in-12 years, etc.), the receiving water ammonia standard would be violated. Residual chlorine standards violations will probably cease to be a problem because dechlorination will be added to the Lander Street process train. If flow assurances are not obtained it is uncertain what actions the facilities planners and EPA will take.

The West Boise plant is being designed to meet receiving water quality standards (CH2M Hill 1980c) at river flow levels present in the receiving waters. Low flow releases from Lucky Peak Dam are not an issue. The West Boise plant will be able to convert ammonia to nitrate through the nitrification process. The Lander Street plant does not have enough land area available to install nitrification processes that are economical. The expansions to the West Boise facilities are not anticipated to cause water quality standards violations.

The pollutant loading from the West Boise treatment facility will increase with the exception of residual chlorine, which will decrease because dechlorination will be installed. Assuming expansion of the existing plant to an annual average effluent flow of 15 MGD, the pollutant loading will increase approximately 150 percent. Construction of the second plant to accommodate a total effluent flow of 24.45 MGD will mean an increase in total loading of 310 percent over existing conditions.

The increase in pollutant loading after plant expansion may impact downstream areas in several ways. The dissolved oxygen decrease downstream from the plants will probably be larger due to greater BOD loadings. Higher nutrient loadings (nitrogen and phosphorus) may cause higher algal growth levels, which may cause larger variations in existing diurnal dissolved oxygen. It is not known whether increases in diurnal dissolved oxygen variation will be great enough to affect fish and other aquatic life.

The expanded Eagle wastewater facilities are being designed to meet discharge requirements and protect water quality in the Boise River. No adverse impacts on Boise River water quality are foreseen.

Construction Impacts

Construction of expanded sewage treatment facilities and interceptor lines in Boise and Eagle will result in short-term local increases in erosion and sedimentation in the vicinity of the construction sites. The Eagle interceptor will cross several watercourses. The south Boise interceptor route alternatives that run along the Boise River appear to have greater sedimentation impact potential than the inland east route (CH2M Hill 1980c).

Mitigation Measures

The main unresolved issue concerning water quality impacts on the Boise River is obtaining an assurance of a 1-in-10 year low flow of 80 cfs from Lucky Peak Dam. The 1-in-10 year low flow is fundamental information that is basic to designing a sewage treatment process train that is sufficient to protect receiving water quality. The design criteria for the Lander Street plant modifications hinge on a 1-in-10 year low flow of 80 cfs. The capacity criteria for the West Boise plant are also dependent on a certain amount of Boise flow going to Lander Street. It would not be wise to proceed to detailed plant planning for Lander Street, and perhaps West Boise, until the flow issue is resolved. Therefore, as a mitigation measure against possible adverse effects, it is recommended that the facilities planners and EPA not proceed to detailed planning for Lander Street or West Boise until the flow issue is resolved.

Construction impacts should be minimized by using earth-moving practices which minimize land disturbance and movement of sediment toward watercourses. The Boise facility planners have already met with Idaho Department of Fish and Game regarding minimization of construction impacts (CH2M Hill 1980c).

Summary of Impacts

Urban growth due to expansion of sewage service will contribute to increased runoff rates and higher storm peaks in storm channels in the Boise area.

Pollutant loading to the river from the Lander Street plant will not change. Violations of standards will be less frequent due to dechlorination.

The increase in total pollutant load following expansion of Boise facilities will be approximately 310 percent. This may cause greater dissolved oxygen sags and algal growth levels in the Boise River and in downstream Snake River reservoirs.

The 1-in-10 year design flows for the Lander Street plant are not assured. Detailed planning for these facilities should not commence until the availability of the flows is assured.

Chapter 10

FISHERY RESOURCES

Existing Habitat Conditions and Species Productivity

Aquatic habitats in Ada County include Lucky Peak, Indian Creek, Blacks Creek, and Hubbard Reservoirs; numerous irrigation canals and drains; the Boise River; the Snake River; and numerous smaller streams, most of which flow only seasonally (Figure 10-1). The Boise River is probably the most significant aquatic habitat with regard to the potential for impacts of Ada County wastewater management alternatives.

Boise River

Historical Perspective. In the early 1800s, the Boise River supported populations of white sturgeon, chinook salmon, sockeye salmon, and steelhead rainbow trout (Caldwell and Wells 1974). These fish are "anadromous" (i.e., they spawn in fresh water and live a part of their life cycle in the ocean). These fish populations migrated to and from the Pacific Ocean via the Snake and Columbia Rivers. Salmon were an important staple for the aboriginal Indian inhabitants of the Boise River Valley.

Gold was discovered in the Boise River Basin in 1862, and sedimentation due to placer mining activities soon severely reduced salmon populations. The construction of Barber Dam in 1906, New York Diversion Dam in 1908, and Arrowrock Dam in 1915 cut off the upper drainage areas to anadromous fish migration (Ada Council of Governments 1973a). Subsequent construction of impassable dams downstream on the Snake River cut off the entire Boise River from anadromous fish migrations.

Present Day Fishes. Today the Boise River supports a diverse fauna of native and introduced game and nongame fishes (Table 10-1). Idaho Department of Fish and Game (IDFG) data indicate that nongame fishes outnumber game fishes by about 10 to 1 (Figure 10-2). The nongame-to-game fish biomass ratio is probably considerably larger than 10 to 1 due to the large size of the suckers. The more abundant nongame fishes are suckers, redside shiner, carp, and chiselmouth; the more abundant game fishes are mountain whitefish, largemouth bass, and bluegill.

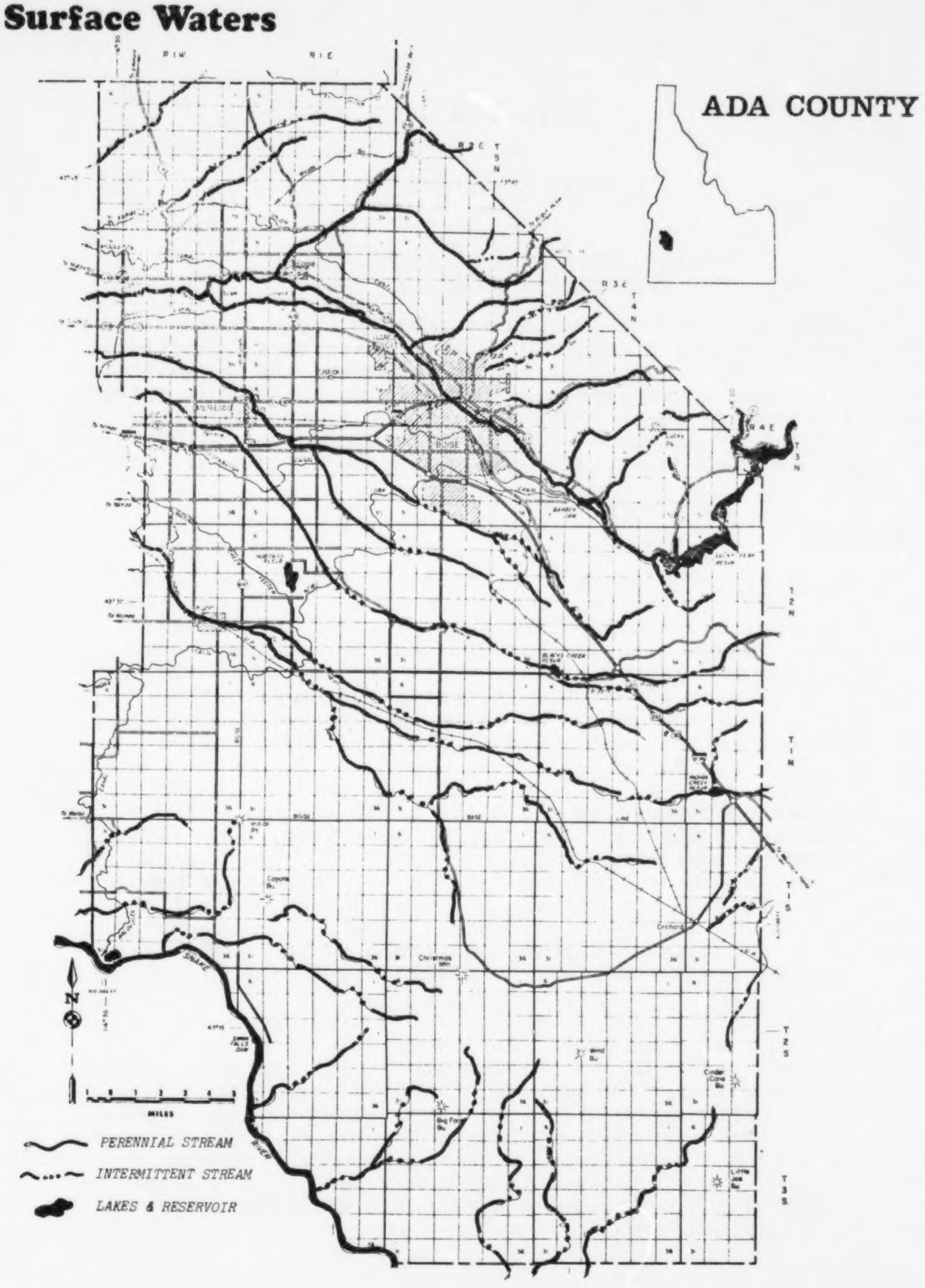

Surface Waters
ADA COUNTY
R1W
R1E
R3E
R4E
T5N
T4N
T3N
T2N
T1N
T1S
T2S
T3S
BOISE
Orchard
Christmas Mtn
Coyote Bu
Cinder Cone Bu
Little Joe Bu
Big Foot Bu
SNAKE RIVER
N
MILES
PERENNIAL STREAM
INTERMITTENT STREAM
LAKES & RESERVOIR

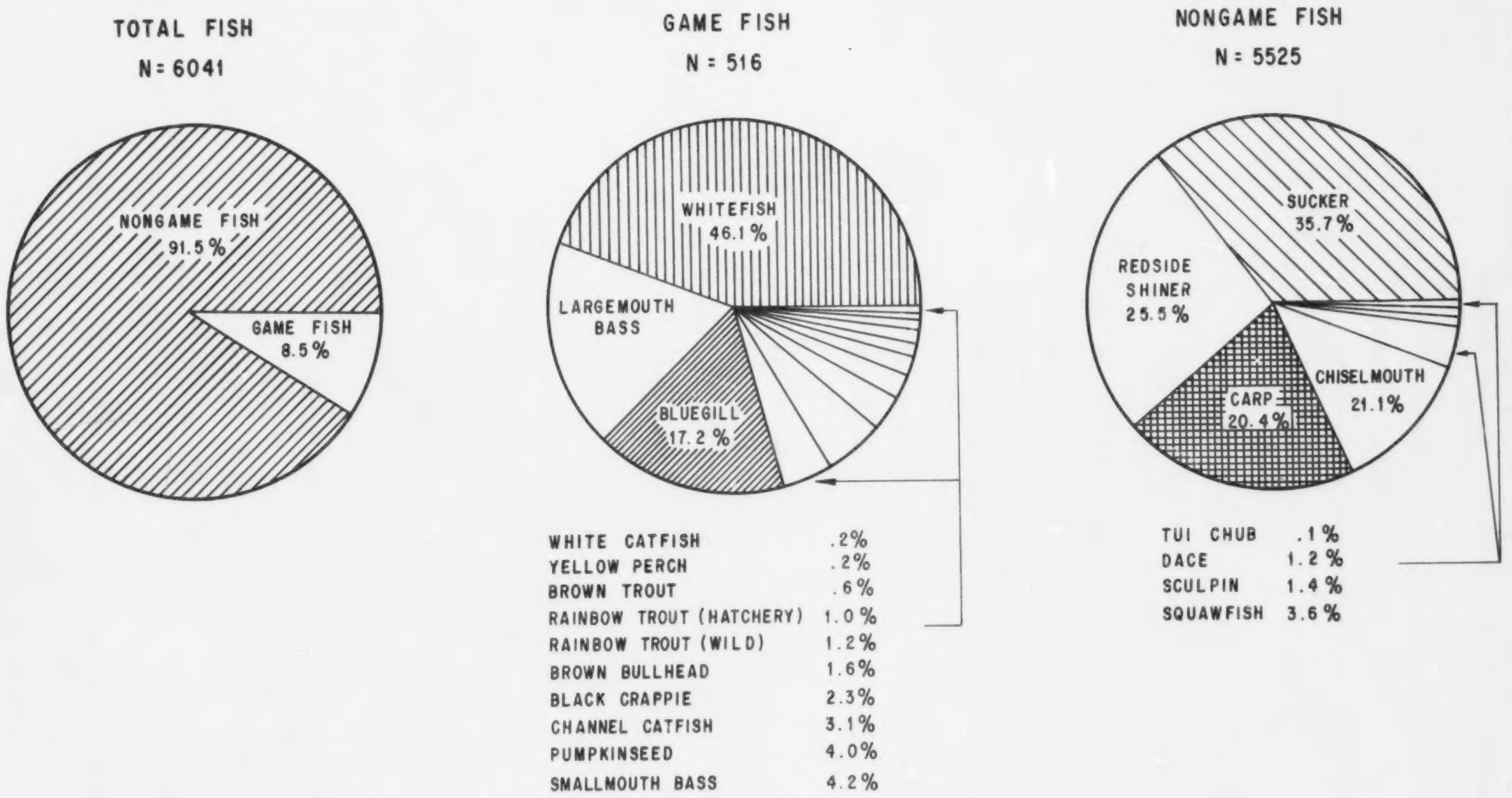
Figure 10-1

SOURCE: Ada Council of Governments 1973a.

Table 10-1. Fishes of the Boise River Between Lucky Peak Dam and the River Mouth

Common Name	Scientific Name
Coho salmon	*Oncorhynchus kisutch*
Kokanee	*O. nerka*
Cutthroat trout	*Salmo clarki*
Rainbow trout	*S. gairdneri*
Brown trout	*S. trutta*
Dolly Varden	*Salvelinus malma*
Mountain whitefish	*Prosopium williamsoni*
Chiselmouth	*Acrocheilus alutaceus*
Carp	*Cyprinus carpio*
Tui chub	*Gila bicolor*
Northern squawfish	*Ptychocheilus oregonensis*
Longnose dace	*Rhinichthys cataractae*
Speckled dace	*R. osculus*
Redside shiner	*Richardsonius balteatus*
Bridgelip sucker	*Catostomus columbianus*
Largescale sucker	*C. macrocheilus*
Mountain sucker	*C. platyrhynchus*
White catfish	*Ictalurus catus*
Brown bullhead	*I. nebulosus*
Channel catfish	*I. punctatus*
Tadpole madtom	*Noturus gyrinus*
Pumpkinseed	*Lepomis gibbosus*
Warmouth	*L. gulosus*
Bluegill	*L. macrochirus*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*M. salmoides*
Black crappie	*Pomoxis nigromaculatus*
Yellow perch	*Perca flavescens*
Mottled sculpin	*Cottus bairdi*

SOURCE: Ada Council of Governments 1973a; Gibson 1978.



SOURCE: GIBSON, 1978

FIGURE 10-2. PERCENTAGE COMPOSITION FOR TOTAL FISH, GAME FISH AND NONGAME FISH IN ELECTROFISHING SAMPLE FROM THE BOISE RIVER (FROM THE MOUTH, UPSTREAM TO BARBER DAM), 11 JULY TO 2 AUGUST, 1974

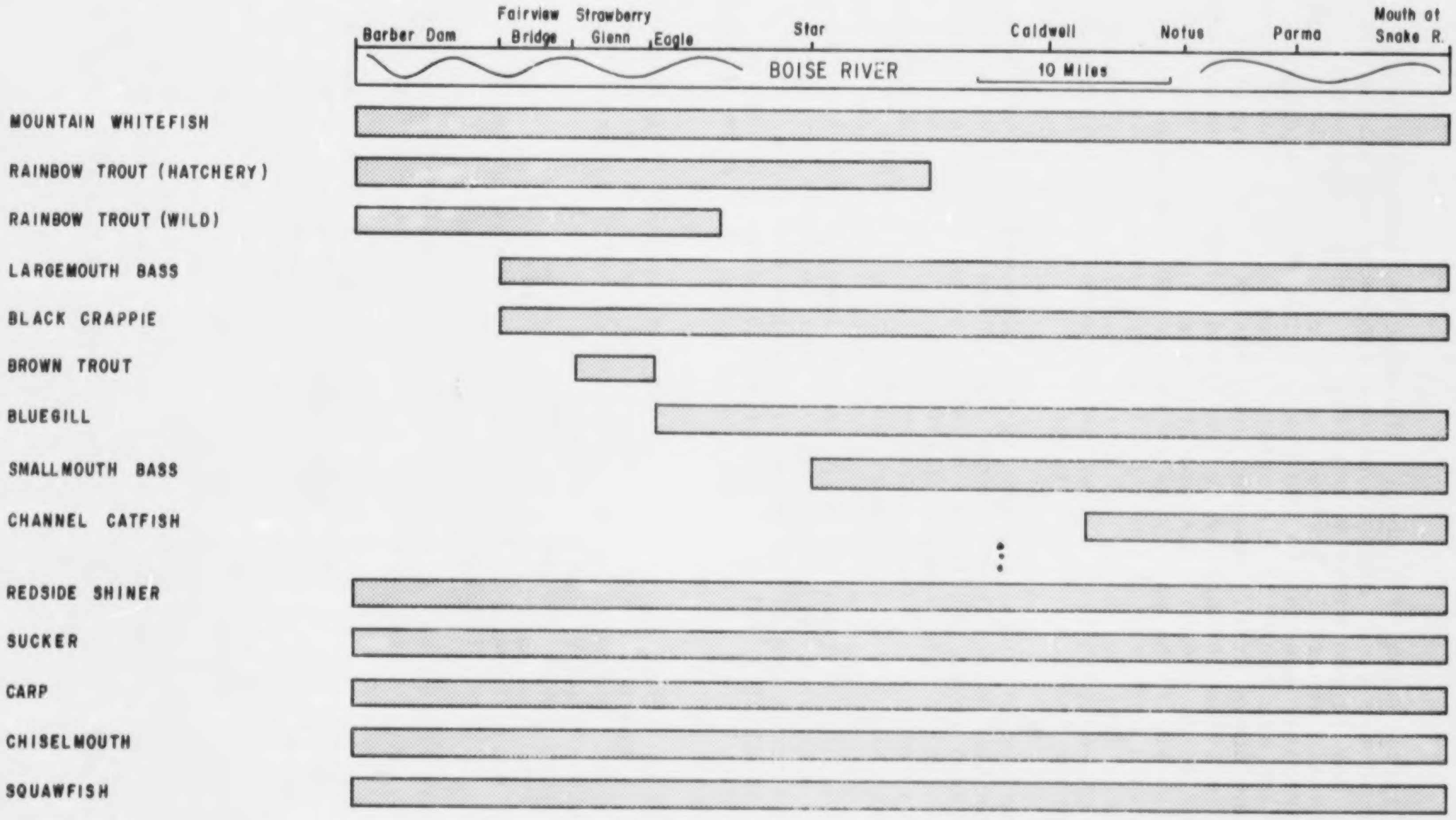
Distribution of Fishes. The species composition of fishes in the river changes as one proceeds downstream from Barber Dam to the river mouth (Figure 10-3). Coldwater species are generally limited to the river reach above Star, and warmwater species to the reach below Star. Although whitefish are found in the entire river, they are much more abundant above Star. Species composition in the vicinity of Boise State University is dominated by whitefish and trout (Kelley pers. comm.). Largemouth bass, black crappie, and bluegill are found mainly in backwater sloughs below Star. Smallmouth bass and channel catfish are most abundant in the river from Notus to the mouth. Redside shiner, suckers, carp, chiselmouth, and squawfish are more evenly distributed than other species (Gibson 1978).

Rainbow trout are probably the most sought after game fish in the Boise River. Population levels are maintained by natural reproduction and by stocking with hatchery fish. IDFG annually stocks about 30,000 catchable size fish at various locations between Barber Dam and Star. Rainbow trout comprise about 0.3 percent by number of all fishes in the river according to electroshocking data (Gibson 1978). The distribution of rainbow trout in the lower Boise River presently extends from approximately Star to Lucky Peak Reservoir. Rainbow trout require good water quality and temperature below about 70°F (21°C). For spawning, gravel should be about 0.5-1 inch in diameter and be relatively free of fine sediments (sand and silt).

Brown trout are a popular non-native game fish species found in the Boise River. Population levels are maintained by natural reproduction and stocking of hatchery-bred fish. The IDFG annually stocks about 25,000 fingerlings in fall in various locations between Barber Dam and Star. Brown trout comprise about 0.01 percent by number of the fishes in the Boise River, according to year-round electroshocking data of Gibson (1978).

Both brown and rainbow trout are opportunistic carnivores, feeding on a variety of invertebrates and smaller fishes.

Mountain whitefish are the most abundant game fish species in the Boise River. The population is maintained entirely by natural reproduction. Whitefish comprise about 4 percent, by number, of the fishes in the Boise River (Gibson 1978). In the Boise River, mountain whitefish spawn in early November through mid-December, and egg incubation extends through March (Reid pers. comm.). Mountain whitefish spawn in gravelly areas; there is no evidence that they excavate any nest and there is little or no selection of gravel size (Brown 1952). Gibson (1978) investigated the food habits of mountain whitefish in the Boise River. Immature aquatic insects were the dominant food items.



SOURCE: GIBSON, 1978

FIGURE 10-3. DISTRIBUTION OF 13 FISH SPECIES IN THE BOISE RIVER FROM BARBER DAM DOWNSTREAM TO THE MOUTH AS DETERMINED BY ELECTROFISHING DURING JANUARY-FEBRUARY, JULY-AUGUST AND OCTOBER, 1974

Human Factors Affecting Aquatic Life. There are many factors associated with human uses of the Boise River and its watershed lands that affect the distribution and abundance of fishes and other aquatic organisms in the river. Many of these factors may also be affected directly or indirectly by Ada County wastewater treatment alternatives. The following discussions summarize the effects of these factors.

Hydrology. The annual stream flow regime of the Boise River has been greatly altered by dam operations and diversions for agriculture and as a result the Boise River below Lucky Peak Dam has: 1) lower winter base flows; 2) reduced winter and spring flood peaks; 3) summer flows that are higher than natural near the upper and lower parts of the river, but lower in the middle near Star; and 4) drastic short-term flow fluctuations. Urbanization, overgrazing, and off-road vehicle use have probably increased flood peak flows in undammed smaller tributary streams such as Cottonwood Creek and Five Mile Creek.

These hydrologic changes have multiple effects on the fish populations. Lower winter flows cause lower pollutant dispersion. They also promote formation of ice cover which hinders oxygen transfer and which, in turn, may increase the effects of waste discharges and occasional pollutant spills during winter. Periodic fish kills in the river were more common in the past. Many industrial waste discharges have been eliminated or treated in recent years (Ada Council of Governments 1973a). Short-term flow fluctuations or complete flow shut-off for maintenance of the outlet structure of Lucky Peak Reservoir strands fish and aquatic invertebrates in pools and makes them more vulnerable to pollution. The stranding of fish should be alleviated when the proposed hydropower facilities are installed in Lucky Peak Dam. Higher peak flood flows from small, undammed tributaries transport high sediment loads from disturbed watershed areas.

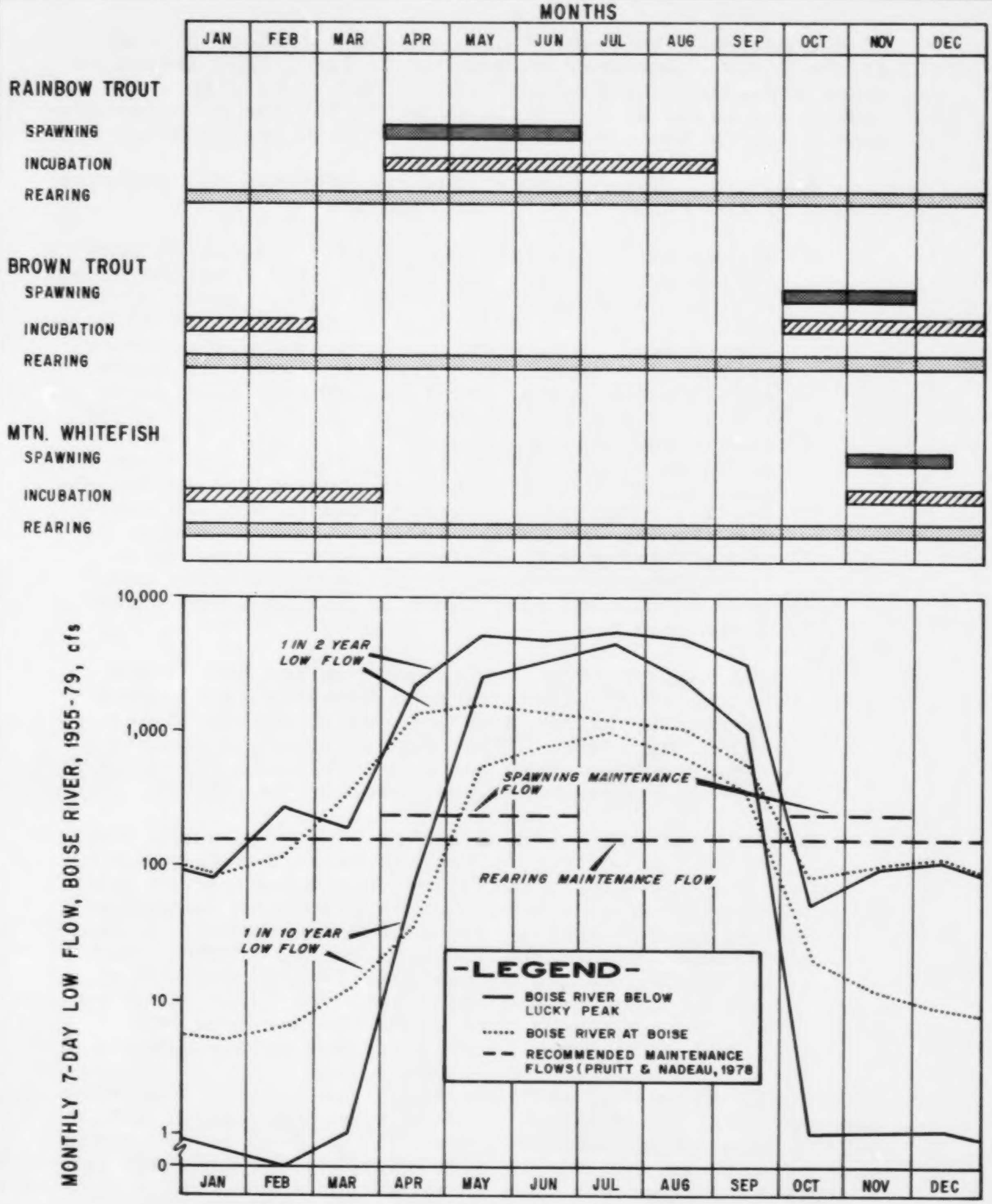
These adverse effects can be mitigated in part by revising the flow regime through Lucky Peak Dam. The recommended minimum flow regime published by the U. S. Fish and Wildlife Service Cooperative Instream Flow Service Group for maintenance of fishery resources is presented in Table 10-2. Comparison of actual flow frequencies to the recommended flow (Figure 10-4) indicates spawning flows for rainbow trout are generally met, but spawning flows for brown trout are not met.

On June 10, 1980, the Federal Energy Regulatory Commission (FERC) issued a license to the Boise Project Board of Control for new hydropower facilities on Lucky Peak Dam. A continuous minimum flow release of 160 cfs was a condition

Table 10-2. Recommended Low Flow Regime in cfs, for the Boise River from Lucky Peak Dam to Snake River

Species/Life Stage	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rainbow Trout												
Spawning				225	225	225						
Incubation				151	151	151	151	151				
Brown Trout												
Spawning										225	225	
Incubation	151	151								151	151	151
Dolly Varden												
Spawning										150	150	
Incubation	100	100								100	100	100
Rearing - All Species	150	150	150	150	150	150	150	150	150	150	150	150
Recommended Flow Regime	150	150	150	225	225	225	150	150	150	225	225	150

SOURCE: Pruitt and Nadeau 1978.



SOURCES: PRUITT & NADEAU, 1978, USGS FLOW DATA (FILE); REID (PERS. COMM.)

FIGURE 10-4. COMPARISON OF TROUT AND WHITEFISH LIFE HISTORY, STREAMFLOWS IN THE BOISE RIVER AND RECOMMENDED MAINTENANCE FLOWS

of the permit. This would have enhanced fishery habitat in the river. However, on October 9, 1980, FERC issued an order repealing the minimum flow release condition. The repeal was based on difficulties with the integrated management of Lucky Peak, Arrowrock, and Anderson Ranch Reservoirs.

Sediment. Human alterations have changed the sediment budget of the Boise River, resulting in:

- Arrowrock, Lucky Peak, Diversion, and Barber Dams have blocked gravel recruitment from upstream areas. This is "armoring" downstream areas, resulting in sediment particle sizes too large for trout spawning use (Nadeau pers. comm.). Most suitable spawning gravels (about 0.5 inch diameter) exist in higher side channel areas, and flows greater than about 1,000 cfs are necessary to provide suitable water depths and velocities over them. Rainbow trout spawn in these gravels during high flow periods of spring, but the nests become exposed due to rapidly falling water levels during summer, and the eggs die (Pruitt and Nadeau 1978). Limited amounts of proper-size spawning gravels are transported to the main stem of Boise River by tributaries downstream of Boise area, such as Indian Creek (Nadeau pers. comm.).

- The reach between Lucky Peak Dam and Barber Dam has received extensive sand deposits from mining operations in the More's Creek watershed in the 1930s and 1940s. These deposits stifle aquatic insect productivity and are unsuitable for trout spawning (Ada Council of Governments, 1973a).

- Fine sediments from sites of overgrazing and construction activities, stream channel alterations, and irrigation return flows are deposited in the river. Urban development in the Boise foothills and gravel crushing operations are especially deleterious (Ada Council of Governments 1973b). Sedimentation renders stream gravels unproductive of aquatic insects and unsuitable for trout spawning due to the clogging of gravel interstices and blockage of water circulation and oxygen transfer.

These changes in sediment budget may affect fish species composition. The Boise River fish sampling data of Gibson (1978) showed that game fish were 9.5 percent of the total fish population, and of the game fish, 46 percent were mountain whitefish, 2.2 percent were rainbow trout, and 0.6 percent were brown trout. Mountain whitefish are closely related to rainbow and brown trout; all three species are in the family Salmonidae.

Both trout and whitefish are characteristic of cool, relatively pollution-free streams, and feed mainly on terrestrial and aquatic invertebrates. Although there is little information on species specific habitat requirements and relative resistance to various kinds of pollution for whitefish and trout, they all are presumably about the same in habitat requirements and resistance to various types of pollutants.

The great difference in relative abundance between trout and whitefish in the Boise River can be explained by a single significant difference between their life histories: trout bury their eggs, while whitefish (and all other fish species in the Boise River) do not. Mountain whitefish are fecund; (i.e., prolific) lay their eggs over bottom types ranging from fine gravel to coarse rubble, and do not build a nest (Brown 1952). Rainbow and brown trout, on the other hand, are not as fecund and require gravel of a definite size range (about 0.5-1 inch) which is relatively free of fine sediments. Sediments hinder water circulation to the buried eggs. Sediment characteristics thus appear to be a factor limiting reproduction of rainbow and brown trout in the Boise River. There is little gravel of the proper size above Boise, and the suitable gravels below Boise are rendered unusable by sedimentation. Other limiting or regulating factors (e.g., lower winter flows and high pollutant loads) during other fish life stages probably affect trout and whitefish more equally.

Sewage Treatment Plants. The present day effects of treated sewage effluent discharges on fish populations in the Boise River are difficult to assess. Studies have not been undertaken since recent improvements were made in treatment processes. The effects of water diversion and nonpoint source pollution complicate assessment of the effects of the discharges. Prior to the treatment plant improvements during the winter low flow periods of 1957 and 1958, testing demonstrated lethal effects on rainbow trout for a distance of 1 mile downstream from the Lander Street discharge point (Webb 1958) at river flows (Boise gage) of 16-95 cfs. There have been no recent direct assessments of lethal or sublethal effects on fish. Presumably, conditions have improved due to the better treatment processes.

Below the Lander Street plant, water quality conditions for ammonia, chemical oxygen demand (COD), dissolved oxygen (DO), and coliform bacteria have periodically violated state standards for levels considered necessary for maintenance of aquatic life.

In 1972-1973, prior to the upgrading of the Lander Street plant, the Ada Council of governments (1975) conducted a study which demonstrated the effects of treated sewage discharges on the benthic macroinvertebrate community in the Boise River. These results can be used to assess the effects of discharges on fish populations, since macroinvertebrate populations are good indicators of water quality conditions. The study showed that pollution-tolerant macroinvertebrates were most abundant between Boise and Eagle Bridge (directly downstream from the Lander plant). Above and below this reach, pollution-sensitive invertebrates were greater. Upgrading of the Lander Street plant since the study was conducted may make the results obsolete; however, nonpoint source pollution (sediment, oil and grease, rubber particles) may have been partially responsible for the results observed.

Impacts of Flow Augmentation and Discharge Routing Alternatives

The *Flow Augmentation and Flow Routing Technical Memorandum* (CH2M Hill 1980b) presented five alternatives for the Lander Street plant to meet former (1979) ammonia standards (0.02 mg/l at temperatures above 5°C, and 0.01 mg/l at temperatures below 5°C). The alternatives were:

1) River flow augmentation through use of uncontracted Lucky Peak Reservoir storage capacity.

2) River flow augmentation through groundwater pumping.

3) River flow augmentation through water exchange (groundwater or Snake River water exchange).

4) Temporary wastewater effluent storage.

5) Wastewater effluent discharge to Farmer's Union Canal.

Since then the instream criterion for un-ionized ammonia below the Lander Street plant was changed to 0.02 mg/l year-round. The facilities planners have performed additional discharge modeling that indicates that they can meet the new water quality standards without any river flow augmentation, special discharge storage or routing schemes, or special ammonia removal facilities assuming a 1-in-10 year low flow of 80 cfs (CH2M Hill 1980c). These alternatives are no longer being considered because stream flow augmentation or special sewage flow routing schemes are no longer necessary to meet 1980 standards. Some of the alternatives, however, are of interest due to their potential for beneficial or adverse impacts on Boise River fishery resources. Maintenance of fishery resources may be a key factor in assuring flow releases from Lucky Peak. These aspects are discussed below.

Direction Augmentation Through Use of Uncontracted Reservoir Storage Capacity. This alternative originally consisted of four alternative hypothetical modes of Boise River reservoir operation (Table 10-3). These modes ranged from a 90th percentile low flow of 8 cfs (mode 1), to a mode which gives a 90th percentile low flow of 130 cfs (mode 2) (Table 10-4). The present mode (mode 3) gives a 90th percentile low flow of 80 cfs.

Mode 1 would probably result in adverse effects on fishery resources, particularly brown trout spawning. Winter flow releases would be a constant 110 cfs. Pruitt and Nadeau (1978) recommended stream resource maintenance flow of 225 cfs (see Table 10-2). One hundred and ten cfs would provide about 70 percent of the weighted spawning width for brown trout (i.e., 70 percent of the total spawning habitat available at 225 cfs). Furthermore, this flow would be available only 68 percent of all years.

Mode 2 would provide the greatest opportunity for improving fish habitat conditions in the Boise River, especially brown trout spawning. Under this mode, the stream resource maintenance flows (225 cfs, October-November; 150 cfs, December-March) would be available 86 percent of all years.

Mode 3, which approximates present reservoir operating conditions, would provide the stream resources maintenance flows 84 percent of all years.

Mode 4 would result in river conditions intermediate between modes 1 and 3.

These direct augmentation alternatives are not strictly alternatives in the sense that they can be directly implemented by the project engineers or the City of Boise. The reservoirs on the Boise River are operated by the U. S. Army Corps of Engineers and the U. S. Water and Power Resources Service. Both of these agencies are currently conducting operational studies of Boise River reservoirs. The actual amount of winter flow releases available for treated sewage effluent dilution and for fishery habitat improvement will probably depend on the findings of these studies.

Direction Augmentation Through Groundwater Pumping. This alternative considered using idle well capacity during winter to augment Boise River flows in years when the full supply cannot be met. Full supply is not met about 16 percent of all years under the present operating regime. This alternative would be beneficial to the Boise River fishery because stream resource maintenance flows would be met in virtually

Table 10-3. River Operation Mode Descriptions

Mode	Operation Description
1	"Lucky Peak Reservoir fill accounting done with irrigation, Fish and Game, and uncontracted space all having same priority date. The entire uncontracted space utilized for flood control or other use so no non-irrigation season flow is available from it. Water in the Fish and Game space is released for non-irrigation season stream flow, providing a continuous flow at Lucky Peak in years with a full water supply. In years with only partial supply available, the available supply is released uniformly through the non-irrigation season."
2	"Lucky Peak Reservoir fill accounting done with irrigation, Fish and Game, and uncontracted space all having some priority date. Water in the entire uncontracted and Fish and Game spaces is released for non-irrigation season stream flow to provide a flow at Lucky Peak of 225 cfs in October and November, and 150 cfs December to March if a full water supply is available. If only a partial supply is available, the available supply is released uniformly through the non-irrigation season."
3	"Lucky Peak Reservoir fill accounting done with irrigation and Fish and Game space having priority date senior to that for the uncontracted space. (Uncontracted space filled last.) The entire uncontracted and Fish and Game spaces are operated as a unit identical to Mode 2. This approximates the operation in the last 2 years."
4	"Lucky Peak Reservoir fill accounting done with irrigation and Fish and Game space having priority date senior to that for the uncontracted space. (Uncontracted space filled last.) This mode assumes that only one-half of the uncontracted space is available for non-irrigation season flow release. That one-half space and the Fish and Game space is operated as a unit identical to Mode 2. The other half of the uncontracted space would be reserved for flood control and normally not filled or the space would be otherwise committed and would not be available for stream maintenance flows."

SOURCE: CH2M Hill 1980b.

Table 10-4. Available Flows for River Operation Modes
(Based on an approximate simulation of river operation during 1928-1977 period)

Operation Mode[1]	Non-irrigation Season Release From Lucky Peak if Full Water Supply Available cfs		Time the Full Water Supply Available		Release Possible 9 Years out of 10 With Available Supplies cfs
			Years	%	
1	110		34	68	8
2	225 150	Oct. & Nov. Dec. thru Mar.	43	86	130
3	225 150	Oct. & Nov. Dec. thru Mar.	42	84	80
4	225 150	Oct. & Nov. Dec. thru Mar.	37	74	60

SOURCE: CH2M Hill 1980b.

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[1] See Table 10-3.

all years, rather than in 84 percent of all years. Disadvantages of this alternative, as compared to alternatives where flow augmentation would come directly from Lucky Peak Reservoir, include: 1) there would be no instream flow benefits to fish upstream of the point(s) where the well water entered the river, and 2) increased energy consumption would be required for pumping the needed water.

Augmentation With Water Exchange. This alternative considered two water exchange schemes to increase winter stream flows.

Groundwater Exchange. This subalternative considered pumping well water to irrigators during the summer in exchange for irrigation water stored in Lucky Peak Reservoir. Stored waters would be released during the winter to meet stream resource maintenance flows. This subalternative would provide stream resource maintenance flows in all years, and would provide more consistent year-to-year fish habitat flows than the present chosen alternative. Energy would be required for pumping.

Snake River Water Exchange. This subalternative considered pumping Snake River water to lands presently irrigated with Boise River water in exchange for stored Lucky Peak water to be released down the river during winter. Like the groundwater exchange alternative, this subalternative would be advantageous to the Boise River fishery because stream resource maintenance flows would be provided in all years. Increased energy consumption, however, would result from pumping.

Temporary Storage. To meet ammonia standards, this alternative considered storing treated sewage flows that were in excess of river assimilation capacity. Effluent would be stored in a detention reservoir constructed near the Lander Street plant and later discharged to Boise River during spring and summer high flows. Under present reservoir operation conditions, up to 4.1 MGD (6.4 cfs) would be stored at a river flow of 80 cfs from Lucky Peak (105 cfs in Boise). This flow removal would probably be insignificant in terms of stream flow for physical fish habitat.

Canal Discharge. This alternative considered discharging treated sewage flows in excess of river assimilation capacity (up to 6.4 cfs) into Farmers Union Canal. The impact on instream flows for the Boise River fishery would probably be insignificant.

Direct Impacts On Fisheries

Expansion of the Boise and Eagle wastewater treatment facilities is not expected to have any significant adverse effects on the fish populations of the Boise River as long as the water quality standards are met. The facilities plan (CH2M Hill 1980c) indicates that receiving water quality standards can be met as long as flow releases from Lucky Peak Dam equal or exceed 80 cfs, which is the anticipated 1-in-10 year low flow. However, additional assurance is needed that 80 cfs will continue to be available during the 20-year life of the project, since part of that supply has already been appropriated to the U. S. Water and Power Resources Service and is subject to sale to irrigators. If the 1-in-10 year flow of 80 cfs is assured, then no significant effects on fish populations will occur in 90 percent of all years. In the other 10 percent of all years (the lowest 10 percent in terms of water flow) some adverse fisheries impacts may occur, depending on how far below 80 cfs releases from Lucky Peak go. The potential for adverse effects on fishes due to residual chlorine will decrease due to dechlorination facilities at the Boise wastewater treatment plants.

Indirect Impacts on Fisheries

Indirect growth-related impacts on fish and wildlife resources will result from the population growth and attendant land use changes associated with provision of new or expanded sewerage facilities. The present (1980) population of Ada County is about 165,000-166,000. That population is projected to increase to about 289,000 by the year 2000 (APA 1978). Of the total increase of 124,000 in Ada County, about 75-85 percent (depending on the population estimates used) is slated to occur in the three sewerage planning areas. Provision of sewerage facilities appears to be a major factor in guiding population growth in Ada County in the next 20 years.

The principal secondary impacts on fisheries accompanying provision of sewerage facilities in Ada County will be nonpoint source pollution resulting from population growth and urban expansion. Nonpoint source pollution includes sediment, oil and grease, rubber particles, and a host of other toxic or oxygen-demanding substances (substances that consume oxygen when decomposing, and thus may deplete the water of oxygen necessary for aquatic life). Increased fishing pressure may also affect populations.

Sedimentation is a major water quality problem in the Boise River, especially below Boise. Fine sediments that clog spawning gravels limit the natural reproduction of rainbow and brown trout in the river reach below Boise. New construction from population growth and from interceptor construction may worsen the problem. Insufficient data exist at this time to quantify the present nonpoint source problem or to quantify future loads and their effects. Additional discussion of sedimentation effects may be found under construction impacts in Chapter 15.

Summary of Impacts

1. Significant direct effects on Boise River fish populations are not expected to the extent that water quality criteria in the Boise River are met. The 1-in-10 year low flow used in designing facilities expansions needs to be assured in order that the receiving water quality criteria can be met.

2. The potential for adverse effects on fish due to residual chlorine will be decreased due to addition of dechlorination facilities at the Lander Street plant.

3. Indirect impacts due to population growth will consist of increased sediment load, and higher flood peak flows from urbanized tributaries. Increased sedimentation of stream gravels will lower habitat quality conditions for trout and whitefish in the Boise River.

Chapter 11

VEGETATION AND WILDLIFE RESOURCES

Environmental Setting

In the following section describing the plant and animal communities of the study area, special attention is given to: 1) habitats of major importance to wildlife, 2) habitats and wildlife that may be impacted by the proposed projects, and 3) plant and animal species of special concern (e.g., endangered species, recreation species). Representative plant and animal species of Ada County are listed by common and scientific name in Appendix E.

Vegetation and Wildlife Habitats

Wildlife Habitat Types. Nine general plant community or wildlife habitat types occur in northern Ada County: 1) riparian, 2) big sagebrush, 3) bitterbrush shrub steppe, 4) irrigated agricultural, 5) nonirrigated agriculture, 6) open water, 7) grassland, 8) Douglas-fir, and 9) urban-industrial (Idaho Department of Fish and Game 1977).

Riparian. Riparian habitat is densely wooded, typically supporting cottonwoods, willows, wild roses, bulrushes, horsetails, cattails, and a variety of forbs and grasses. Riparian areas provide excellent wildlife habitat with their mix of water, wildlife forage plants, and cover. Riparian habitat occurs along the Boise River, except where the river flows through the densely developed areas of the City of Boise. One stretch of riparian habitat extends from Barber Flats downstream through the Barber Pool area to the southern end of the Warm Springs Golf Course. The Barber Pool area supports approximately 650 acres of riparian habitat. Immediately downstream of the Strawberry Glen Airport in Garden City lies approximately 225 acres of riparian habitat. A 150-acre stand of riparian habitat occurs on the north channel of the Boise River southwest of Eagle. Except for these three areas, the riparian community is seldom very wide (>25 yards); in many cases the riparian vegetation is absent or only a few trees wide. Riparian vegetation formerly extended further inland from the active river channel, but has been replaced by agricultural or urban-industrial uses. Downstream of the Eagle area, the strip of riparian vegetation is usually wider than that along the river near Boise. Riparian habitat also occurs along some of the tributary creeks draining the Boise Front.

Sagebrush, Bitterbrush, and Grasslands. Prior to urbanization and agricultural development in Ada County, most of the county was brushland or grassland. Riparian habitat occurred along the rivers, and forests were found in the high mountains.

Bitterbrush-dominated shrubland presently occurs at midelevations of the foothills north and east of Boise. Sagebrush-dominated shrubland occurs in the foothills above and below the bitterbrush communities, as well as comprising most of the vegetation of southern Ada County. Grasslands occur north of the Boise River and southeast of Boise, and in small, scattered locations elsewhere in the county. In addition, various grasses form part of the understory for the forests and shrublands. Cheatgrass, crested wheatgrass, bluebunch wheatgrass, Idaho fescue, and Indian ricegrass are among the county's common grasses.

Agriculture. Large tracts of irrigated farmland lie west of Boise and Eagle. Other scattered irrigated and nonirrigated agricultural lands lie in eastern Ada County and in southwestern Ada County near the Snake River. In the last 10 years, large parcels of agricultural land southwest of Boise have been converted to housing and other urban uses.

Corn is the primary row crop in the county. Alfalfa, grains, sugar beets, and mint are among the other crops. Irrigation is accomplished through furrow and large moving sprinkler systems. Livestock production and dairies are additional agricultural activities.

Open Water. Open water habitats are the surface waters of lakes, reservoirs, and streams. Riparian habitat often occurs around the edges of such areas. Lucky Peak Reservoir, Lake Lowell, Indian Creek Reservoir, and the Boise River are examples of open water habitat. Large sewage treatment ponds also serve as open water wildlife habitat.

Douglas-Fir. Along the upper crest of the Boise Front in northeastern Ada County, Douglas-fir and ponderosa pine are the dominant plants. The forest community formerly extended farther downslope and into some lower drainages; fires and timber harvest have limited the forest to the higher slopes

Urban-Industrial. Boise, Garden City, Eagle, Meridian, Star, and Kuna, as well as development in unincorporated areas, comprise the urban-industrial habitats of Ada County.

Within the Boise River floodplain, many areas support relatively large trees. Parks, golf courses, and various open space areas provide a combination of natural and artificial (e.g., landscaping) vegetation within the urban complex.

Threatened and Endangered Plant Species. Two plant species are listed as candidates for threatened or endangered status by the U. S. Fish and Wildlife Service (Table 11-1). Mulford's milk vetch and Hannah aase's onion are currently under going evaluation to identify locations of populations, number of plants, degree of endangerment, and other parameters which will help to determine the status of these plants. The U. S. Fish and Wildlife Service (Merhoff pers. comm.) expects to officially propose these species for threatened or endangered listing in the near future.

Both plant species are closely associated with soils of sedimentary origin; locally these soils are found in a narrow band at the base of the foothills east of Boise (Steele pers. comm., U. S. Soil Conservation Service 1979). Because these plants are closely associated with a specific limited soil type, it is unlikely that further surveys will discover numerous additional populations or broaden their known distributions.

Mulford's milk vetch historically has been identified on 10 sites; but, only two populations have been recently verified (Kennison 1980). Threats to this species are conversion of native habitat to agriculture, excessive grazing pressure, and urban development.

Hannah aase's onion has 10-12 known populations. Its means of reproduction is by bulb division. A sexual reproduction (bulb division) in this species has promoted uniformity among plants within individual populations and notable differences among populations. Maintenance of different populations is crucial to maintenance of the genetic variation of the species. The total range of this plant is approximately 5 miles by 20 miles. Threats to the continued existence of this species are urban development and gravel extraction (Packard 1979).

Wildlife

A variety of wildlife species utilize the habitats of Ada County, either seasonally or year-round. Many species are migratory, occurring in the county primarily during one season or passing through the county briefly in spring or fall. Deer, for example, summer in the high mountains, and winter at lower foothills (because snow excludes them from

Table 11-1. Vegetation - Candidate Threatened or Endangered Plant Species[1,2,3]

Plant Name (Scientific/Common)	Proposed Status[4]	Known Locations	Plant Community	Elevation, Slope, Soils	Comments
Astragalus mulfordiae Mulford's milkvetch	T[5]	Foothills east of Boise; Owyhee, Washington Counties in Idaho; Malheur County, Oregon; 5 sites.	Steppe, shrub-steppe desert shrub, sagebrush-grass. Plant associates include sagebrush, bitterbrush, fescue, wheatgrass.	2,000-3,000 feet; level to moderate slope; sandy soils, particularly along old river deposits.	Seldom abundant where it occurs, and sites usually very small.
Allium aaseae Hanna Aase's Onion	E	Known only from the benches in the vicinity of Boise and Emmett; 10-12 sites.	Immediate habitat bare, bordered by bitterbrush and buckwheat; surrounding community is sagebrush-grass.	2,850-4,400 feet; slope usually steep, most often on eroding faces of river terraces; gravelly and sandy soils, sedimentary in origin.	Plants usually abundant on proper habitat, but such sites very restricted. Narrow habitat suitability indicates most of potential habitat is probably occupied; no potential alternate range.

[1] See Table 10-3 for definition of threatened or endangered

[2] A total of 23 and 45 plant species in Idaho have been previously proposed for endangered or threatened status, respectively, by the U. S. Fish and Wildlife Service, Office of Endangered Species (Federal Register: June 16, 1976; July 1, 1975). The list of proposed species expired December 10, 1979. Species that had not either been officially designated threatened/endangered or deleted from the proposed list remained candidate species. Status of candidate species are continuing to be reviewed; as a result some species have been officially reproposed (and officially listed in some cases). The two candidate species listed above are undergoing evaluation and will be officially proposed for threatened or endangered listing in the near future. Two other species included in the initial proposals (Draba douglasii and Primula cusickiana) have been recommended for deletion from further threatened or endangered consideration (Merhoff pers. comm.).

[3] Data Sources: Henderson et al. (1977); Packard (1979); Kennison (1980).

[4] Status listed in expired proposals (see note 2 above). T = threatened; E = endangered.

[5] Henderson et al. (1977) recommended changing status to endangered.

the higher elevations). Reptiles, on the other hand, are year-round residents because of their restricted mobility.

Wildlife by Habitat Type. Some of the characteristic or common wildlife species inhabiting each of the county's habitats are discussed below. Some wildlife species are closely associated with a given habitat, whereas other species occupy several habitats.

Riparian. Riparian habitat generally supports a more diverse wildlife population than any other habitat type because of the diversity of food and cover plants and the availability of water.

Muskrats and beavers have been reported in the Barber Pool area. Raccoons, deer, skunks, and foxes typically inhabit riparian areas.

The most visible component of the wildlife community in riparian areas is the various water-associated birds. Great blue herons, Canada geese, mallards, green-winged-teals, belted kingfishers, and killdeer are common on the water and in the adjacent vegetation. Yellow-headed blackbirds, red-winged blackbirds, and quail may be observed in the adjoining upland areas. Black-billed magpies construct their stick nests in the trees. Great blue herons have established rookeries near Eagle (Figure 11-1) and Star (Ada Council of Governments 1973a). Birds of prey are commonly observed in or near riparian habitat. Bald eagles, ospreys, marsh hawks, and Swainson's hawks have been seen along the Boise River.

Amphibians, such as the spotted frog, are common in riparian areas due to abundant water supplies. Garter snakes and other reptiles may also be observed.

Sagebrush, Bitterbrush, and Grasslands. The arid foothill and southern portion of the county support sagebrush, bitterbrush or grassland habitats. Coyotes commonly occur in these habitats, preying largely upon mice and other small mammals. Deer migrate from the higher mountains into these areas during winter, feeding on the shrubs and other plants remaining uncovered by snow. Badgers, Ord kangaroo rats, Townsend ground squirrels, and black-tailed jackrabbits are among the other common mammals of these habitats.

Brushlands and grasslands are foraging habitats for many birds of prey, such as golden eagles, prairie falcons, kestrels, burrowing owls, and ferruginous hawks. Other birds characteristically inhabiting such areas are sage grouse, long-billed curlews, ravens, horned larks, meadowlarks, and savannah sparrows.

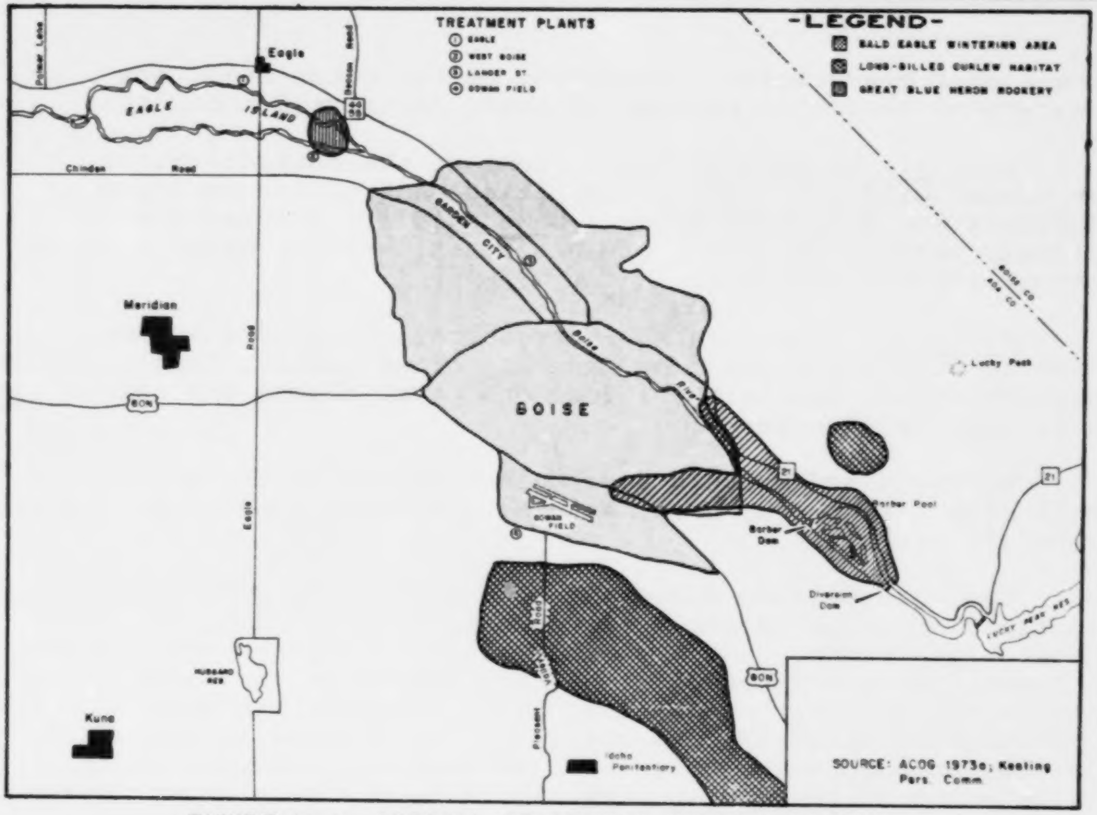
TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST
④ GOWAN FIELD
-LEGEND-
BALD EAGLE WINTERING AREA
LONG-BILLED CURLEW HABITAT
GREAT BLUE HERON ROOKERY
Eagle
Beacon Road
Palmer Lane
EAGLE ISLAND
Chinden Road
GARDEN CITY
Boise River
Meridian
Eagle Road
80N
BOISE
21
Barber Pool
Barber Dam
Diversion Dam
GOWAN FIELD
Lucky Peak
LUCKY PEAK RES
BOISE CO
ADA CO
HUBBARD RES
Kuna
Pleasant Valley Road
Idaho Penitentiary
SOURCE: ACOG 1973a; Keating Pers. Comm.
N

FIGURE 11-1. SPECIES OF SPECIAL CONCERN HABITAT

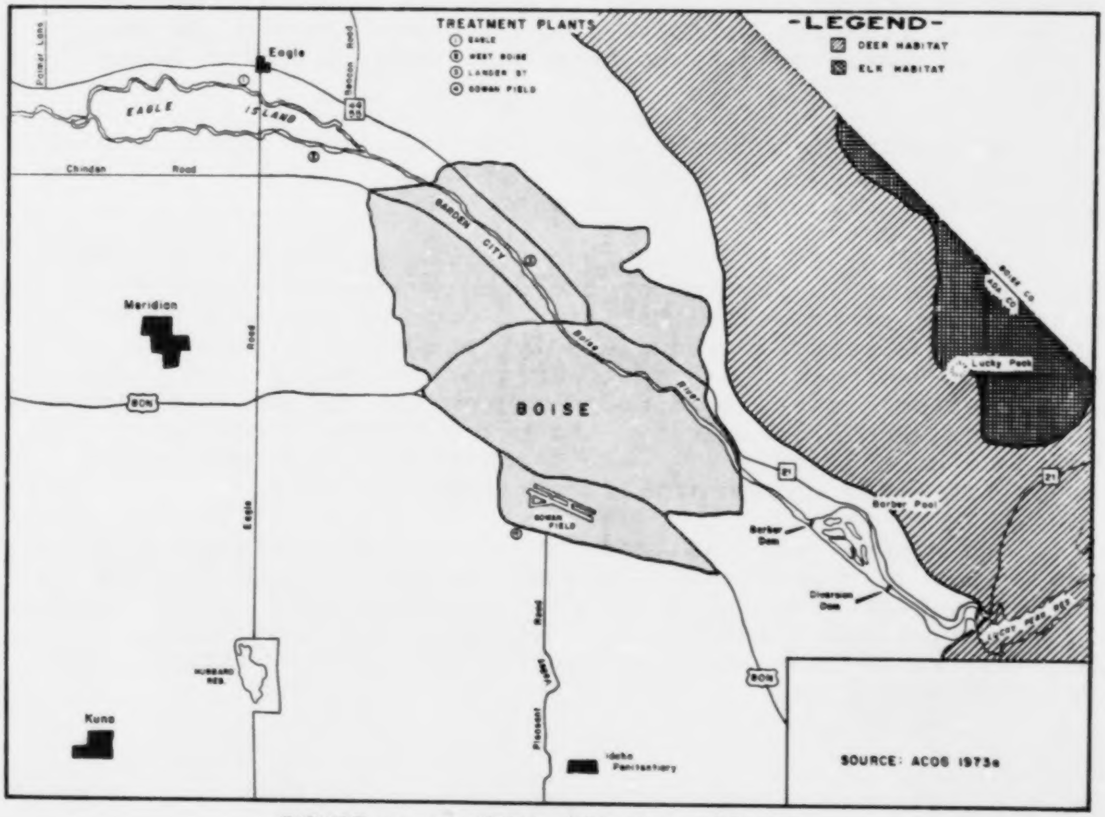
TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST
④ GOWAN FIELD
-LEGEND-
DEER HABITAT
ELK HABITAT
Eagle
Beacon Road
Palmer Lane
EAGLE ISLAND
Chinden Road
GARDEN CITY
Boise River
Meridian
Eagle Road
80N
BOISE
21
Barber Pool
Barber Dam
Diversion Dam
GOWAN FIELD
Lucky Peak
LUCKY PEAK RES
BOISE CO
ADA CO
HUBBARD RES
Kuna
Pleasant Valley Road
Idaho Penitentiary
SOURCE: ACOG 1973a

FIGURE 11-2. DEER AND ELK HABITAT

Western fence lizards, western rattlesnakes, and sagebrush lizards are typical reptiles in this habitat. Amphibians are uncommon because of arid conditions.

Agriculture. Farmland provides suitable habitat for many wildlife species, as long as escape and breeding cover is maintained between and around the fields. Ring-necked pheasant, mourning doves, quail, and cottontail rabbits are major species of agricultural areas. Waterfowl feed on stubble and leftover grain in harvested fields. Marsh hawks, burrowing owls, and coyotes will forage for the mice and other small mammals that live on farmlands. Amphibians occur in the irrigation and drainage ditches.

Open Water. Open water habitats serve as resting and feeding areas for waterfowl and other water-associated birds. Many species remain in the county year-round, breeding and nesting in vegetation adjacent to the water. Barber Pool is an excellent waterfowl breeding area, producing 125-150 Canada geese annually (Ada Council of Governments 1973a). The greatest water-associated bird populations occur during spring and fall migrations. Mallards, green-winged teal, shoveler, California gulls, white pelicans, American avocets, and great blue herons are some of the species using the lakes and streams of Ada County. Osprey and bald eagles forage for fish and bald eagles prey on waterfowl in this habitat.

Douglas-Fir. Mammals inhabiting the Douglas-fir areas include elk, deer, snowshoe rabbits, red squirrels, golden-mantled ground squirrels, porcupines, and bushytail woodrats. Bird species include blue grouse, ruffed grouse, mountain chickadees, pine siskins, and red-breasted nuthatches. Spotted frogs and garter snakes also occur in this habitat.

Urban-Industrial. Wildlife species inhabiting urban areas are tolerant of human activity. Three of the most common species (i.e., house mouse, house sparrow, starling) are introduced. Other species include raccoons, common nighthawks, black-billed magpies, cedar waxwings, and robins.

Threatened Species, Endangered Species, and Species of Special Concern. Four mammal, ten bird and two reptile species designated as endangered or known to be of special concern to governmental agencies or private groups are occasional, seasonal, or year-round inhabitants of the study area. Table 11-2 summarizes the status, habitat requirements, food habits, distribution, and other information regarding these species. Of the listed species, the bald eagle and long-billed curlew are the most likely to be impacted by the current project; these two species are discussed below.

Table 11-2. Terrestrial Wildlife - Endangered and Threatened Species and Species of Special Concern[1]

Common Name	Status[2]	Habitat and Special Requirements[3]	Food Habits[3]	Distribution/Comments[3]
		MAMMALS		
Spotted bat	Sen, PT	Usually arid open or scrub habitat; may enter buildings and caves; highly selective of daily roost sites in cracks and crevices of high cliffs and canyons.	Primarily moths	Extremely uncommon; summer migrant.
River otter	Sen	Riparian habitats along streams and lakes	Fish	Probably few (if any) in Boise River below Lucky Peak Dam.
Kit fox	Sen, Sp Con	Vegetation arid land; open, level sandy ground for burrowing.	Small rodents	Very rare; confined to arid areas in southern portions of the state.
Bobcat	Sen, Sp Con	May occur in most wildlife habitats in county; dens in rock crevices and hollow logs.	Small mammals, birds, carrion	Some populations have been considerably reduced in recent years; probably few (if any) in Boise River below Lucky Peak Dam.
		BIRDS		
Ferruginous hawk	Sen, Sp Con, PT, BL	Arid sagebrush lands; grasslands, rangelands, open country; nests built of sticks (primarily big sagebrush) in cliffs, in trees, or on the ground; readily deserts nests if disturbed.	Jackrabbits, cottontails, and rodents	Restricted to the sagebrush areas of the Snake River plains; populations limited; observed occasionally.
Southern bald eagle	E, Sen	Roost near rivers, reservoirs, and lakes providing sufficient food supply; also forages in adjacent sagebrush, grassland, and agriculture; scavenger and predator.	Fish, waterfowl, rabbits, rodents	Winter migrant; as many as 12 bald eagles have been observed wintering along lower Boise River; Barber Pool primary wintering area.
Osprey	Sen, PT, BL	Roost and forage near rivers, reservoirs and lakes.	Fish	Seasonal migrant in southern Idaho.
Prairie falcon	Sp Con, PT, BL	Tall sagebrush and shrublands in Ada County; plains, prairies, deserts; nests on cliffs.	Ground squirrels, other small mammals, birds	Snake River Birds of Prey Natural Areas has one of the world's largest nesting populations (i.e., 5 percent of world's total).
Peregrine falcon	E, Sp Con	Wide ranging; open country; nests on cliffs usually near marshes and streams providing adequate food.	Birds	Very uncommon seasonal migrant.
Columbian sharp-tailed grouse	Sen, Sp Con, PT, BL	Nonirrigated agriculture, grass-shrub habitat, prairie.	Seeds, buds, berries	Low populations in Ada County.
Bobwhite	Sp Con	Cottonwood-willow riparian; farmland; brush open country; roadsides.	Seeds of legumes, woody herbs, and cultivated grains, insects	Low, stable populations in restricted habitat; along Boise River downstream of Garden City.

Table 11-2 Cont'd.

Common Name	Status[2]	Habitat and Special Requirements[3]	Food Habits[3]	Distribution/Comments[3]
Mountain quail	Sen, Sp Con	Bitterbrush shrub steppe; brushy mountain and forest slopes.	Pine seeds, acorns berries	Low population north of Lucky Peak Reservoir; and Along Crane, Hulls, Warm Springs, and Maynard Creeks.
Northern long-billed curlew	Sen, PT, BL	Open short grass prairie; agriculture, rangelands, sagebrush and bitterbrush shrublands.	Insects	Nest north of Barber Pool.
Western burrowing owl	Sen, PT, BL	Grasslands, sagebrush, desert, farms; utilizes former rodent and badger burrows.	Small mammals, insects	Populations: low in winter-spring; medium in summer-fall.
		REPTILES		
Western ground snake	Sen, Sp Con	Annual grasslands; tall sagebrush; sand and subsurface moisture.	Spiders, centipedes, insects, insect larvae	Medium year-round population levels.
Desert night snake	Sp Con	Annual grasslands; tall sagebrush; deserts.	Frogs, lizards	Medium year-round population levels.

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[1] Species of Special Concern: Species whose population numbers are known to be of concern to governmental agencies or scientific, educational, or public interest groups.

[2] Status:

E - Endangered Species: designated endangered under the Federal Endangered Species Act of 1973 (as amended through December 28, 1979). "The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man."

T - Threatened Species: designated threatened under the Federal Endangered Species Act of 1973 (as amended through December 28, 1979). "The term 'threatened species' means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Sen - Sensitive Species: Designated as sensitive in a Master Memorandum of Understanding between the Idaho Department of Fish and Game and the U. S. Bureau of Land Management (1977). Sensitive species are those lacking official listing and: ". . . [a] whose populations are consistently small and widely dispersed, or whose ranges are restricted to a few localities, such that any appreciable reduction in numbers, habitat availability, or habitat condition might lead toward extinction; and [b] whose numbers are declining so rapidly that official listing may become necessary as a conservation measure."

Sp Con - Species of Special Concern: Listed as a species of special concern in the fish and wildlife "Policy Plan" of the Idaho Department of Fish and Game (1973). "Species of special concern are those species whose restricted range, specific habitat requirements and/or low population numbers make them vulnerable to elimination from the state if adverse impacts on populations or habitat occur."

PT - Potentially Threatened: included in the original identification of potentially threatened wildlife, the "Red Book" (U. S. Fish and Wildlife Service 1973), but not now designated as endangered or threatened (U. S. Fish and Wildlife Service 1980), or listed as status-undetermined by Mohler (1974).

Table 11-2 Cont'd.

BL - Blue List: Included in the National Audubon Society "Blue List"; an "annual 'early warning list' of declining, threatened, or vulnerable [bird] species" (Arbib 1979). Only those species having some additional status designation are listed above.

[3] Habitat requirements, life history, distribution, and other information taken from: Burt and Grossenheider 1976; Idaho Department of Fish and Game 1977, 1978; Jensen 1980; Mohler 1974; National Fish and Wildlife Laboratory 1980; Peterson 1961; Snow 1972, 1973, 1974a, 1974b, 1974c; Stebbins 1966; U. S. Bureau of Land Management 1980; U. S. Fish and Wildlife Service 1973; Zarn 1974a, 1974b.

Bald Eagle. The southern bald eagle is designated "endangered" by the U. S. Fish and Wildlife Service. Historically and as late as the 1880s, bald eagles nested along the Boise River near Eagle, feeding on the large steelhead and salmon runs. Elimination of the fish runs by damming the river and the urbanization of the Boise area has restricted local bald eagle activity primarily to winter use of the Barber Pool (Figure 11-1) (Keating pers. comm.). One to five bald eagles make incidental use of the Boise River riparian habitats between Boise and Star (Howard pers. comm.).

Barber Pool is a large area of wooded riparian habitat, islands, and braided river channels behind Barber Dam. An abundant whitefish and salmonid fishery provides the primary prey for the eagles; waterfowl, jackrabbits, and various upland species comprise a smaller percentage of the prey. Jensen (1980) surveyed the Boise River between Mores Creek Bridge and Boise during the winter of 1979-1980. As many as 12 bald eagles were observed along the river, 7 in Barber Pool. Bald eagles occupied the area from late October to early April. Eagles roost in taller cottonwoods and on cliffs south of the river.

Northern Long-billed Curlew. The northern long-billed curlew is one of 14 bird species designated as "sensitive" under a memorandum of understanding between the Idaho Department of Fish and Game and the U. S. Bureau of Land Management (1977). The species has no official threatened or endangered status, but was listed by the U. S. Fish and Wildlife Service (1973) as a "status undetermined" species (i.e., possibly threatened with extinction, yet sufficient information to conclusively determine its status was lacking). Mohler (1974) also listed this species as status undetermined.

The long bill and long legs of the curlew adapt it to feeding on insects in short grass plains, rangelands, and agricultural fields. Nesting occurs in open prairie and is easily disturbed by human activity.

Curlews are largely spring and summer inhabitants of Ada County, usually leaving Idaho to migrate to the southwestern United States by August. Curlews nest in suitable upland habitat northeast of Barber Dam (Keating pers. comm.), and in central and northwestern Ada County (Ada Council of Governments 1973a) (Figure 11-1). The U. S. Bureau of Land Management recently conducted a study of long-billed curlews in Canyon County; analysis and publication of results have not been completed.

Recreational Species. A variety of recreational wildlife (i.e., game species) occur in Ada County. Ducks, ring-necked pheasant, mourning doves, chukar partridge, quail, and Hungarian partridge are the major birds harvested in the county; blue grouse, ruffed grouse, geese, and sage grouse are also taken. Elk, deer, and cottontails are the county's game mammals. Figures 11-2 through 11-6 illustrate the distribution of some of these species in Ada County.

Deer migrate to the lower foothills of the Boise Front or south of Lucky Peak Reservoir from higher elevations during winter when snow is deep or temperatures are severe. Deer formerly migrated onto the Snake River Plain as far downstream as Lake Lowell; urbanization has eliminated most such long migrations.

Breeding areas for waterfowl are limited in Ada County, although approximately 10,000 ducks are produced annually from breeding areas in Barber Pool, along the Boise River downstream of Garden City, along the Snake River, and at the county's smaller reservoirs.

Quail occur in the riparian and brushy habitats along several of the county's creeks and the Boise River. Chukar and Hungarian partridge inhabit arid brushlands and some agricultural fields. Blue grouse and ruffed grouse are restricted to the timbered areas of the Boise Front; sage grouse occur in sagebrush habitat south of Lucky Peak Reservoir.

Pheasant occur in most of the agricultural areas of the county. Pheasant are well adapted to farmland habitat, as long as sufficient cover exists along fencerows, between fields, and along roads. Consolidation of small farms into large farms, cultivation and mowing up to and directly adjacent to the fenceline, and modern sprinkler irrigation techniques reduce availability of suitable habitat to pheasants.

Mourning doves are widespread throughout most of Ada County. Farms, grassland, brushland, riparian areas, and woods all provide habitat for this species.

Impact Analysis

The projected direct and indirect impacts of the planned facilities are discussed below. Direct impacts are those resulting from facility construction or operation at the plant sites, along the pipeline routes, or at the sludge disposal sites. Indirect impacts are those resulting from growth and urbanization that would not have occurred without increased waste treatment capacity.

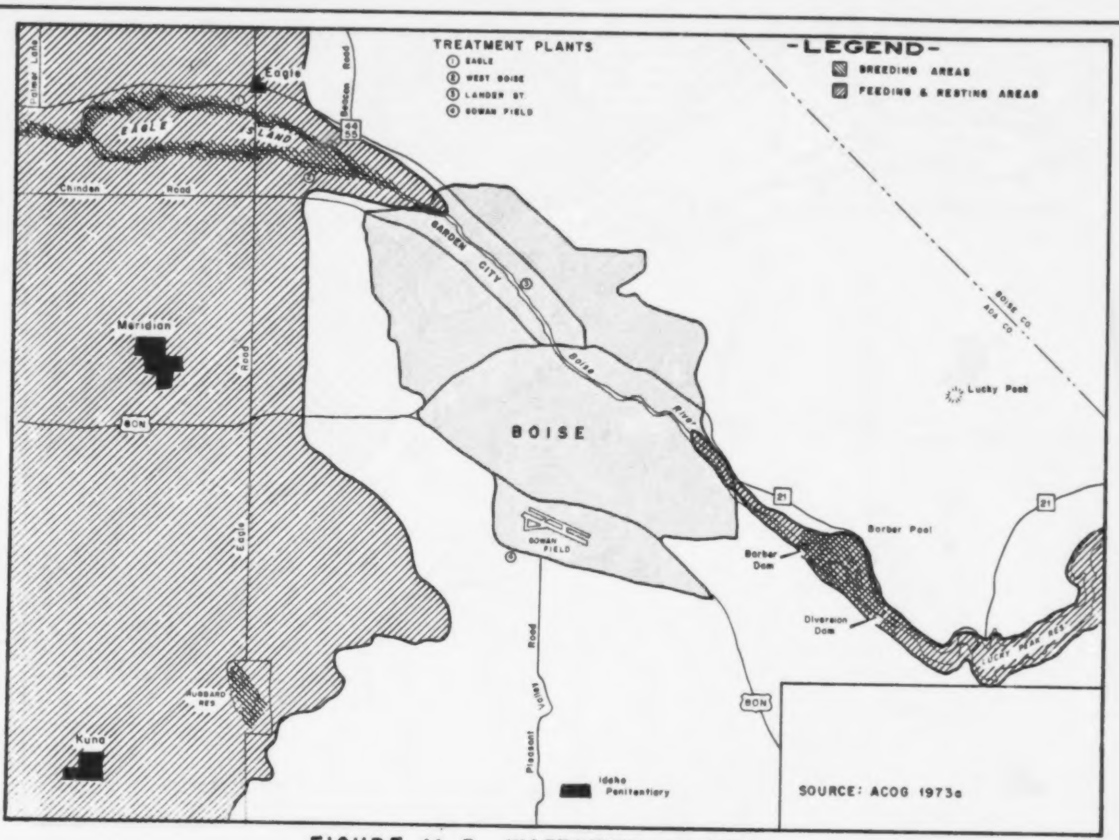

TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST.
④ GOWAN FIELD
-LEGEND-
BREEDING AREAS
FEEDING & RESTING AREAS
Palmer Lane
Eagle
Seaman Road
44
55
EAGLE ISLAND
Chinden Road
GARDEN CITY
BOISE CO
ADA CO
Meridian
Boise River
Lucky Peak
80N
BOISE
21
Barber Pool
GOWAN FIELD
Barber Dam
Eagle Road
Diversion Dam
LUCKY PEAK RES.
HUBBARD RES.
Pleasant Valley Road
80N
Kuna
Idaho Penitentiary
SOURCE: ACOG 1973a

FIGURE 11-3. WATERFOWL HABITAT

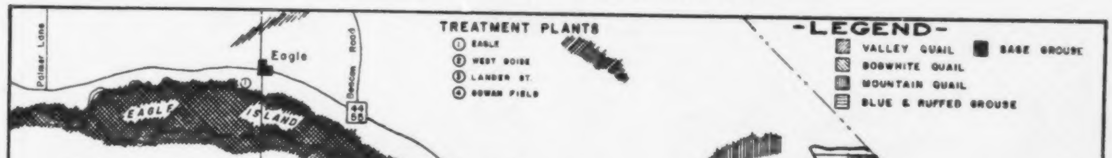
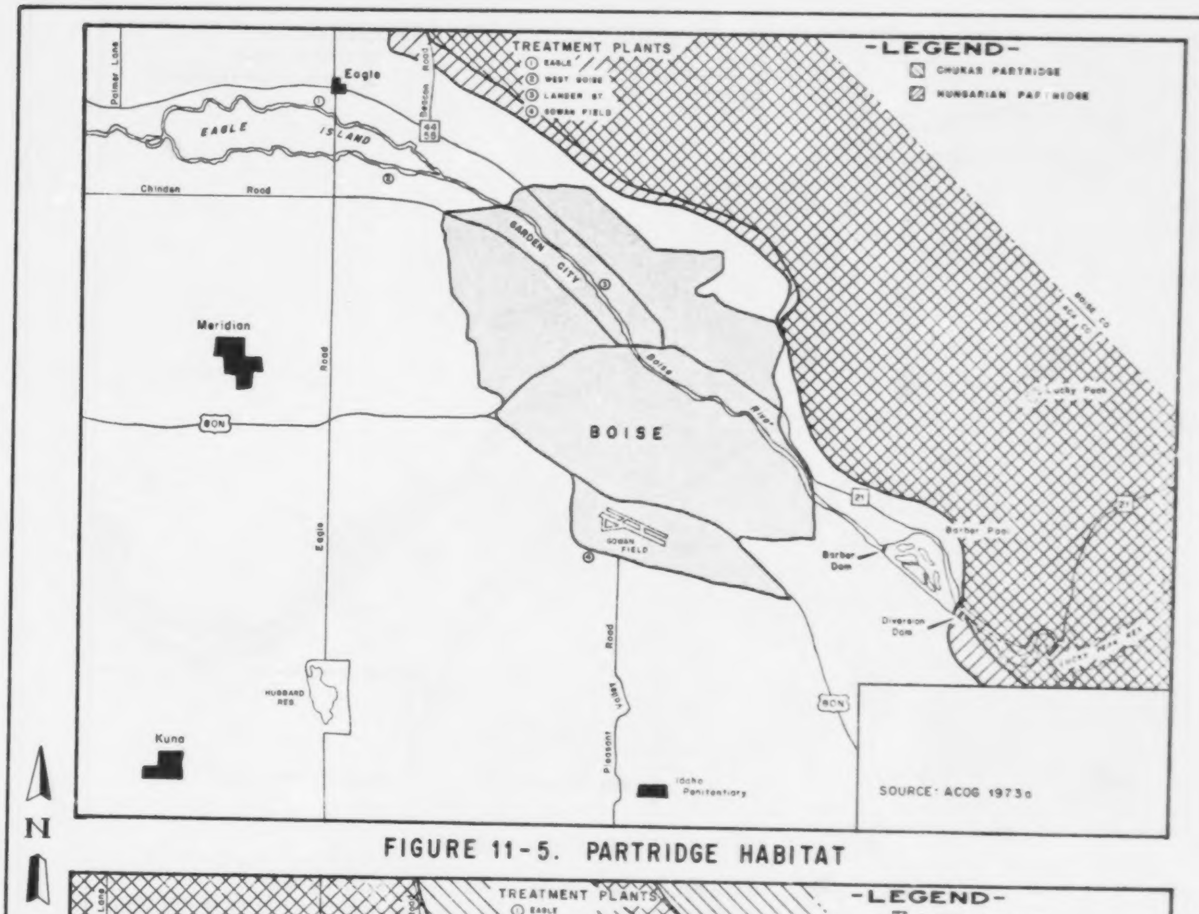
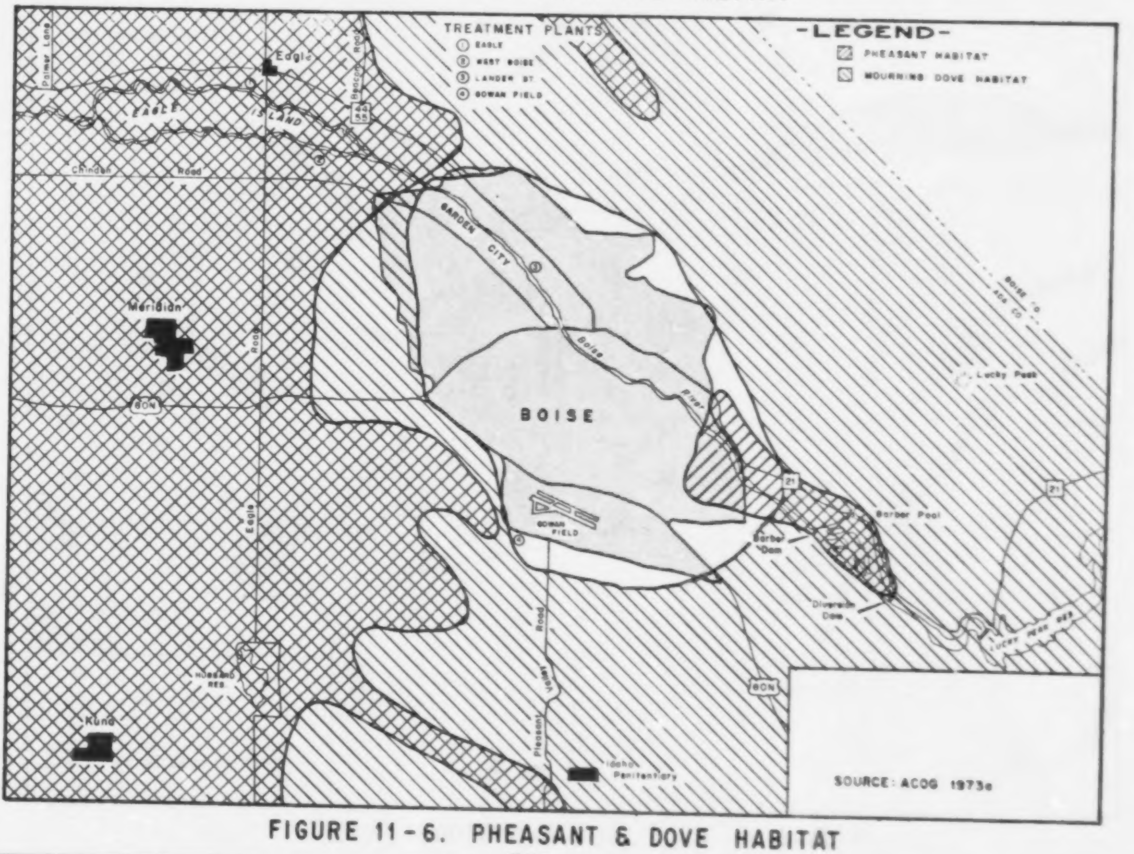

TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST.
④ GOWAN FIELD
-LEGEND-
VALLEY QUAIL
BOBWHITE QUAIL
MOUNTAIN QUAIL
BLUE & RUFFED GROUSE
SAGE GROUSE
Palmer Lane
Eagle
Seaman Road
44
55
EAGLE ISLAND
Chinden Road
GARDEN CITY
BOISE CO
ADA CO
Meridian
Road
Boise River
Lucky Peak
80N
BOISE
21
Barber Pool
GOWAN FIELD
Barber Dam
Eagle
Diversion Dam
LUCKY PEAK RES.
HUBBARD RES.
Pleasant Valley Road
80N
Kuna
Idaho Penitentiary
SOURCE: ACOG 1973a

FIGURE 11-4. QUAIL AND GROUSE HABITAT


TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST
④ GOWAN FIELD
-LEGEND-
CHUKAR PARTRIDGE
HUNGARIAN PARTRIDGE
Palmer Lane
Eagle
EAGLE ISLAND
Beacon Road
Chinden Road
GARDEN CITY
Meridian
Boise River
BOISE
80N
Eagle Road
Lucky Peak
21
Barber Pool
Barber Dam
GOWAN FIELD
Diversion Dam
LUCKY PEAK RES
BOISE CO.
ADA CO.
HUBBARD RES.
Pleasant Valley Road
Kuna
Idaho Penitentiary
N

SOURCE: ACOG 1973a

FIGURE 11-5. PARTRIDGE HABITAT


TREATMENT PLANTS
① EAGLE
② WEST BOISE
③ LANDER ST
④ GOWAN FIELD
-LEGEND-
PHEASANT HABITAT
MOURNING DOVE HABITAT
Palmer Lane
Eagle
EAGLE ISLAND
Beacon Road
Chinden Road
GARDEN CITY
Meridian
Boise River
BOISE
80N
Eagle Road
BOISE CO.
ADA CO.
Lucky Peak
21
Barber Pool
Barber Dam
GOWAN FIELD
Diversion Dam
LUCKY PEAK RES
HUBBARD RES.
Pleasant Valley Road
Kuna
Idaho Penitentiary

SOURCE: ACOG 1973a

FIGURE 11-6. PHEASANT & DOVE HABITAT

Direct Impacts

Lander Street and West Boise. Expansion of the capacity of the Lander Street and West Boise facilities will have few direct impacts at the plant sites. Biotic communities of the sites are currently highly disturbed. Most construction will occur within the existing plant sites in areas formerly used for waste treatment or in landscaped areas. Disturbance of local wildlife during construction should be minor and temporary. Disturbance caused by operation of the expanded plant should not be significant.

Construction of the sludge pipeline will impact plant communities slightly along the route, including riparian habitat where the pipeline crosses the river. The vegetation should recover following construction if no right-of-way maintenance program is instituted.

Sludge disposal at the penitentiary should have little or no effect on wildlife. If additional acreage is brought under cultivation as part of the project, some of the native species supported on the presently uncultivated land will be lost. The cultivated fields, however, will provide forage for agriculture-tolerant species.

Eagle. Construction of the new Eagle facilities treatment ponds will eliminate a minimum of 15 acres of riparian habitat along the Boise River. Additional riparian acreage will be eliminated by construction of facility buildings and roads, as well as the connecting pipeline between the old and new facilities.

The proposed plant site is located in a flood hazard zone and is in one of the largest riparian communities along the river. The riparian community provides excellent habitat for deer, raccoons, yellow-headed blackbirds, kingfishers, great blue herons, and many other species because of its size and configuration (extends over 100 yards inland from the edge of the river). Riparian areas that are only a line of trees or a narrow band of vegetation along the streamcourse do not support the great wildlife diversity that such a large, deep parcel is able to support. The riparian habitat at the Eagle site is of even greater importance because it is one of only three large riparian areas in the reach of the river from Boise to Eagle (the other two are: 1) downstream of the Strawberry Glen Airport, and 2) at Barber Pool).

Loss of the riparian habitat will reduce the wildlife populations inhabiting the site. Water-associated birds and mammals will be detrimentally affected. Available roosting sites for raptors, including possibly an occasional bald eagle, will be reduced.

Executive Order 1190, Protection of Wetlands, will apply to the proposed Eagle plant site. The order "requires Federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists" (40 CFR 6.302). As defined in this policy, "wetlands" includes marshes, sloughs, river overflows, and similar areas. EPA's Statement of Procedures on Floodplain Management and Wetland Protection (44 FR 1455) requires EPA programs to determine if proposed actions will affect wetlands. If a program will affect a wetland, the responsible official must prepare a wetlands assessment. Adverse impacts to the wetlands must be avoided if possible or mitigated if no practical alternative exists.

The pipeline from the ponds to the rapid infiltration site is expected to run along existing rights-of-way. Such areas are already highly disturbed, and construction impacts on wildlife should be negligible.

The rapid infiltration site is currently under cultivation and is immediately adjacent to a heavily stocked feedyard that is completely lacking in vegetative cover. A wooded canal that will carry infiltration effluent runs along the south side of the site. No impacts are expected at the site with the possible exception of some disturbance in the canal when drainage pipes are being installed.

Southwest Area. Because the "rural lifestyle" land use plan (APA 1980) for this area is currently the most likely to be implemented, no direct impacts are foreseen.

Indirect Impacts

Boise and Eagle. The major impacts of expansion of the Boise and Eagle facilities will result from accommodating urban growth. The habitats primarily impacted will be the agricultural lands and the arid brushland-grasslands in the foothills of the Boise Front and on the Snake River.

Many or all of the local populations of the two candidate threatened or endangered plant species could be lost to urbanization if no provisions are made for protecting the population. Developments impacting these endangered plants may be proposed and approved without the facilities expansion.

Loss of the farmlands, brushlands, and grasslands will reduce the populations of the species (e.g., pheasants and mourning doves) inhabiting those areas. Foraging habitat for raptors such as kestrels and marsh hawks will be reduced.

As urban areas extend into the foothills, deer winter ranges will be detrimentally affected. Although most of the crucial wintering areas of the Boise Front are in public ownership (Parker pers. comm.), some important areas will be lost, and the incremental losses of wintering areas of lesser importance will continue. Increased recreation, especially off-road vehicles and snowmobiles, will also degrade the wildlife habitats along the Boise Front.

Urban growth will likely impact the feeding or nesting areas of the long-billed curlew, through both direct habitat loss and disturbance by increased human activity in adjacent areas. Urbanization near Barber Pool will increase disturbance and decrease secondary foraging habitat for bald eagles. Higher local human populations will increase use of the Barber Pool area for recreation. The majority of recreation use, however, should occur in summer when eagles are absent. The level of nearby human activity that bald eagles will tolerate is unknown.

Southwest Area. The loss of agricultural and brushland-grassland habitat to high density urban development will be avoided by implementing the "rural lifestyle" alternative. Urban growth will occur on larger lots suitable for septic tank systems, however, taking some farmland out of production, replacing existing vegetation with landscaping plants, and increasing human activity. Pheasants and other farmland wildlife will be detrimentally impacted, and raptor foraging habitat will be reduced. These impacts will be less severe than would be projected for higher density development.

Impact Summary

Few direct wildlife impacts will result from the proposed projects. A major direct detrimental impact will be the loss of a large area of Boise River riparian habitat at the proposed Eagle plant site. Accommodated urban growth will cause the greatest long-term impacts on wildlife. Conversion of open spaces in the foothills and on the plain to housing and industry will reduce the available habitat for many species. The bald eagle and long-billed curlew are especially vulnerable to disturbance.

Potential Mitigation Measures

Prior to any decision to provide federal assistance to the City of Eagle for wastewater treatment facilities, EPA will evaluate alternative sites that may either avoid or lessen the impact to the existing wetland. If, in its evaluation, EPA finds that no other feasible alternatives exist, mitigation measures aimed at protecting the wetland will be proposed and coordinated with the U. S. Fish and Wildlife Service. The results of the evaluation will be included in the Final EIS.

Urbanization and recreation within or adjacent to Barber Pool should be planned to minimize bald eagle disturbance. Development, for example, should be discouraged near the cliffs used as roosting sites, and winter recreation should be directed toward the periphery of the pool, rather than through the middle of it. Similarly, development should be directed away from curlew nesting areas.

Chapter 12

AGRICULTURAL LANDS IN ADA COUNTY

Introduction

An important environmental issue is the impact on agricultural lands of community growth accommodated by expanded wastewater treatment facilities. The preservation of agricultural lands in the face of development pressures is considered a significant land use issue in Ada County.

At the national level, EPA has established a policy to protect agricultural lands by not undertaking any action or program that would encourage the loss of important agricultural lands. EPA's policy is a direct outgrowth of a national policy to protect prime agricultural land.

This chapter describes agricultural resources in Ada County, reviews policies on the protection of agricultural resources, and assesses the agricultural conversion process as it relates to Ada County.

Agricultural Resources in Ada County

Although Ada County has historically been viewed as the center for business and government in Idaho, agriculture has also played an important role in the local economy. In 1974, the total market value of all agricultural products sold surpassed $34 million. Principal farm products included wheat, barley, alfalfa, corn, livestock, and livestock-related products.

The identification of agricultural lands as prime farmland is based on soil characteristics, climate and water availability. The presence of these conditions allows for the production of "relatively more food with less erosion and with lower demand for fertilizer, energy and other resources" than nonprime land (Peterson 1976).

In Ada County, prime farmland has not been mapped. Although the Soil Conservation Survey has recently completed a soil survey in Ada County, the designation of prime farmland was not provided. In the absence of Soil Conservation Survey designation, prime farmland in Ada County can be identified based on prior mapping of soil capability and water availability. All lands designated as Class I and Class II in Figure 12-1 are considered prime farmland. The soil classes are described in Table 12-1.

Trends in Agricultural Use

Information identifying present trends in agricultural use for Ada County is limited. According to the 1974 Census of Agriculture (U. S. Bureau of the Census 1977) there were approximately 75,000 acres of irrigated cropland in Ada County in 1974. Other estimates of irrigated cropland in Ada County include 125,000 acres in 1975 by the Idaho Department of Water Resources (1978) and approximately 112,000 acres in about 1970 by ACOG (1975b). This wide range in estimates of irrigated farmland makes it difficult to determine any distinct trends in agriculture production in Ada County.

Some information on trends in agricultural use in Ada County is presented in the 1974 Census of Agriculture for Idaho (Table 12-2). Although it appears that some clear-cut trends such as decreasing farm size are evident, reports from Ada County sources conflict with this conclusion (ACOG 1975b). Local officials are not in agreement as to the impact of urbanization on irrigated cropland in Ada County (Johnson pers. comm.).

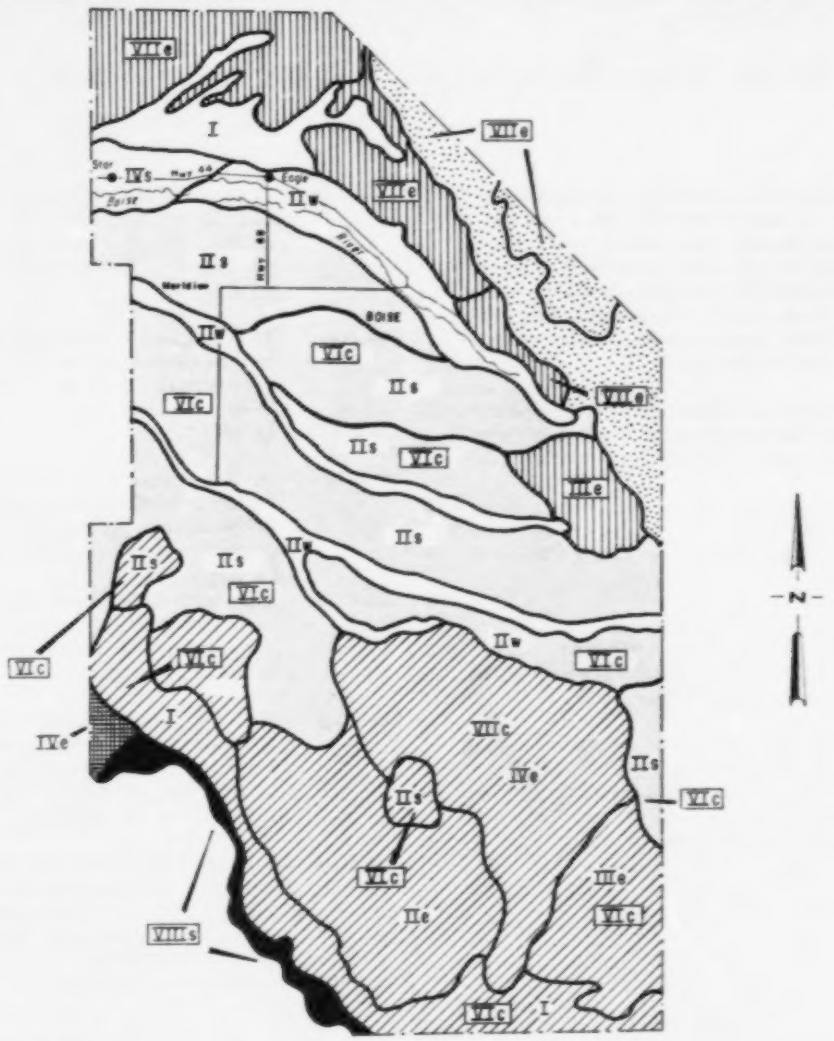
Agricultural Lands Conversion Process

The continued loss of agricultural lands, and particularly prime farmland, has become a national concern because prime agricultural land is a nonrenewable resource and its conversion to urban uses is irreversible. Pressures influencing the conversion of farmland to urban development are complex and have been addressed at all levels of government.

An Overview of Agricultural Land Conversion Process

A farmer's decision to sell farmland for development is a complex phenomenon. According to the U. S. Council on Environmental Quality (Peterson 1976) four different types of factors appear to be at work: economic (market forces), demographic (age), secondary (impacts on neighboring land uses), and transitional (desire for change).

Economic Factors. Economic factors are of two kinds. First, a very high price for a farm may be offered, in which case it may be difficult not to sell the farm. Second, economic returns may not be sufficient to continue farming. Causes



-LEGEND-

▨ A. Moderately coarse to medium textured soils on steep mountain slopes of the Idaho Batholith
- A-1 Takeuchi - Ola Association
- A-2 Rainey - Ola - Brownlee Association

▥ B. Moderately coarse to very fine textured soils on rolling to very steep lacustrine & fluvitile deposits of the Glenns Ferry Formation
- B-1 Ada - Brent - Day Association
- B-2 Lolalita - Lankbush - Payette Association
- B-3 Lankbush - Lolalita - Haw Association
- B-4 Lanktree - Ada - Day Association

□ C. Medium to moderately coarse textured soils on alluvial bottoms & lowlands on level to nearly level slopes
- C-1 Harpt - Bissell - Jenness Association
- C-2 Falk - Moulton - Goose Creek Association
- C-3 Brom - Moulton - Baldock Association
- C-4 Olaga - Wndack - Dras Association

□ D. Medium to very fine textured soils on nearly level or level alluvial terraces above the Boise River
- D-1 Purdam - Power - Tess Association
- D-2 Elijah - Colthorp - McCain Association
- D-3 Chilcott - Lanktree - McCain Association

▨ E. Medium textured loess-like soils over Snake River basalt or alluvial gravels on level to gently rolling slopes
- E-1 Potrats - Scism - Trevino Association
- E-2 Garbutt - Bahem - Scism Association
- E-3 Scism - Bahem - Trevino Association
- E-4 Elijah - Colthrop - Trevino Association
- E-5 Minidoka - Scism - Cencove Association

▤ F. Moderately coarse to medium textured soils on nearly level to gently sloping terraces and alluvial fans adjacent to the Snake River
- F-1 Turbyfill - Feltham - Cencove Association

■ G. Very shallow to non-existent soil mantle on rock outcrops, bluffs and cliffs along the Snake River Canyon
- G-1 Rock Outcrop - Canyons Associations

VIc Indicates A Dry Classification

IIIe Indicates An Irrigated Classification

FIGURE 12-1. SOILS CAPABILITY FOR AGRICULTURE

Table 12-1. Soils Capability for Agriculture

Agricultural land capability classification contains two general divisions: 1) Land suited for cultivation and other uses (Classes I through IV), and 2) land limited in use and generally not suited for cultivation (Classes V through VII). The capability classification is a practical grouping of soils. Soils and climate are considered together as they influence the use, management, and production of agricultural endeavors.

The agriculture capability classes are of a general nature with each class representing general uses applying in each class. The classes are briefly described as follows:

Class I:	Soils in Class I have few or no limitations or hazards. They may be used safely for cultivated crops, pasture, range, woodland or wildlife.
Class II:	Soils in Class II have few limitations or hazards. Simple conservation practices are needed when cultivated. They are suited for the same uses as Class I.
Class III:	Soils in Class III have more limitations and hazards than those in Class II. They require more difficult or complex conservation practices when cultivated. They are suited for the same uses as Class I.
Class IV:	Soils in Class IV have greater limitations and hazards than Class III. Still more difficult or complex measures are needed when cultivated. They are suited for the same uses as Class I.
Class V:	Soils in Class V have little or no erosion hazard but have other limitations that prevent normal tillage for cultivated crops. They are suited to pasture, range, woodland or wildlife.
Class VI:	Soils in Class VI have severe limitations or hazards that make them generally unsuited for cultivation. They are suited largely to pasture, range, woodland or wildlife.
Class VII:	Soils in Class VII have very severe limitations or hazards that make them generally unsuited for cultivation. They are suited to grazing, woodland or wildlife.
Class VIII:	Soils and land forms in Class VIII have limitations and hazards that prevent their use for cultivated crops, pasture, range or woodland. They may be used for recreation, wildlife or water supply.

Capability classes are divided into subclasses. These show the principal kinds of conservation problems involved. The subclasses are: "e" for erosion, "w" for wetness, "s" for soil and "c" for climate. For example, A-1 (Takeuchi-Ola association) is Class VII e, i.e., a Class VII soil with erosion limitation.

SOURCE: Ada Council of Governments (ACOG) 1975a.

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Table 12-2. Farms, Land in Farms, and Land Use in Ada County, 1974 and 1969

		All farms		Farms with sales of $2,500 and over	
		1974	1969	1974	1969
All farms	number	1 292	1 524	925	944
Land in farms	acres	244 218	321 035	232 034	305 253
Average size of farm	acres	189	211	251	323
Approximate land area	acres	667 712	667 712	667 712	667 712
Proportion in farms	percent	36.6	48.1	34.8	45.7
Value of land and buildings	$1,000	158 035	122 987	137 142	105 182
Average per farm	dollars	122 318	80 700	148 262	111 422
Average per acre	dollars	647	383	591	345
Farms by size:					
1 to 9 acres		136	208	54	55
10 to 49 acres		548	634	302	260
50 to 69 acres		89	90	77	71
70 to 99 acres		145	211	140	198
100 to 139 acres		118	137	103	131
140 to 179 acres		84	85	81	84
180 to 219 acres		31	39	30	37
220 to 259 acres		31	24	30	22
260 to 499 acres		52	43	52	33
500 to 999 acres		32	23	31	23
1,000 to 1,999 acres		14	19	14	19
2,000 acres and over		12	11	11	11

		All farms		Farms with sales of $2,500 and over	
		1974	1969	1974	1969
Land in Farms According to Use					
Total cropland	farms	1 194	1 406	868	899
	acres	118 242	122 289	110 412	111 966
Harvested cropland	farms	1 027	1 178	805	821
	acres	73 615	81 447	70 756	76 442
Farms by acres harvested					
1 to 9 acres		139	201	51	367
10 to 19 acres		163	200	79	
20 to 29 acres		149	135	110	
30 to 49 acres		157	179	147	
50 to 99 acres		226	272	225	264
100 to 199 acres		131	137	131	136
200 to 499 acres		48	39	48	39
500 to 999 acres		10	12	10	12
1,000 acres and over		4	3	4	3
Cropland used only for pasture or grazing	farms	766	1 018	545	650
	acres	29 120	23 849	24 366	19 507
Other cropland (see text)	farms	96	290	71	(NA)
	acres	15 507	16 993	15 290	16 017
Total woodland	farms	28	17	25	11
	acres	2 709	3 153	2 375	2 593
Other land (see text)	farms	936	1 155	698	(NA)
	acres	123 267	195 593	119 247	190 694
Irrigated land	farms	1 108	1 243	831	825
	acres	80 297	84 428	75 882	77 450

		Farms with sales of $2,500 and over	
		1974	1969
Other cropland	farms	71	(NA)
	acres	15 290	16 017
Cropland in cover crops, legumes, and soil-improvement grasses, not harvested and not pastured	farms	3	26
	acres	205	633
Cropland on which all crops failed	farms	11	19
	acres	6 814	429
Cropland in cultivated summer fallow	farms	19	116
	acres	5 256	9 730
Cropland idle	farms	41	93
	acres	3 015	5 225
Total woodland	farms	25	11
	acres	2 375	2 593
Woodland pastured	farms	20	8
	acres	2 016	1 659

		Farms with sales of $2,500 and over	
		1974	1969
Total woodland – Continued			
Woodland not pastured	farms	6	4
	acres	359	934
Other land	farms	698	(NA)
	acres	119 247	190 694
Pastureland and rangeland, other than cropland and woodland pasture	farms	182	187
	acres	110 314	182 216
Improved pastureland and rangeland	farms	113	76
	acres	7 897	6 372
Unimproved pastureland and rangeland	farms	83	130
	acres	102 417	175 844
Land in houselots, barnlots, ponds, roads, wasteland, etc.	farms	640	699
	acres	8 933	8 478

SOURCE: U. S. Bureau of Census 1977, pg. IV-7.

for poor returns may include low prices for products, low yields, high transportation costs to the market, high costs for farm supplies, high labor costs, and high property taxes. It is important to note that high property taxes at the urban/rural fringe due to valuation of farmland at its highest and best use are only one of the many factors influencing the farmer considering the sale of farmland.

Demographic Factors. The most important demographic factor in the decision to sell a farm is age of the owner. As farmers near the age of retirement, they may attempt to pass the farm on to a relative or willing neighbor; if this is not possible, then farmers may consider putting their farms up for sale.

Secondary Factors. Limitations placed on farm production due to urban encroachment are secondary factors. These factors may include limitations on crop dusting or fertilizer production, traffic conflicts on farm roads, and theft or vandalism of crops. Each of these factors can reduce farm productivity and create a nuisance for farm operations.

Transitional Factors. Transitional factors are difficult to predict. As urban encroachment advances, an "impermanence syndrome" may become established and a farmer may begin to consider moving to another location to either continue farming or to look for a different kind of work.

Interaction of Various Factors. The interaction of these various factors in the decision to sell a close-in farm has been described by U. S. EPA (1977b) as follows:

> "As urban pressures begin to weigh on agricultural operations, a chain of events is set in motion. Rising taxes and development pressure begin to take their toll on neighboring farms; as the number of farms begins to decline, the important support industries, such as feed and grain dealers, farm equipment outlets, etc., begin to leave the area ... In time, farm labor becomes more expensive and scarce ... The farmer slowly feels his political strength drain away as county and local governments ... begin passing "nuisance" ordinances ... Typically, the farmer's profit margin begins to shrink ... For those who wish to remain in farming, the choices come down to hanging on for as long as possible and then selling to the highest bidder, usually a developer, or selling out and moving the operation to an area that has a stronger agricultural community."

Existing Measures for Retention of Agricultural Lands in Ada County

Federal, state, and local agencies have addressed the problems of loss of agricultural lands, and policies have been developed that are applicable to Ada County.

Federal. Federal activities related to agricultural land preservation are carried out mainly by the CEQ and the SCS. The CEQ has directed federal agencies that under all agency actions "efforts should be made to assure that such farmlands are not irreversibly converted to other uses unless other national interests override the importance of preservation or otherwise outweigh the environmental benefits derived from their protection" (Peterson 1976). Consistent with the CEQ directive, EPA in 1978 established an agencywide policy to mitigate or reduce adverse impacts to agricultural lands and to encourage farmland preservation efforts at the local and federal level that are consistent with environmental quality goals (U. S. EPA 1978c).

Among the actions which EPA has established to implement its policy on protection of agricultural lands, several are related directly to the proposed projects.

- "Specific project decisions involved in the planning, design, and construction of sewer interceptors and treatment facilities shall consider farmland protection. Consistent with Agency cost-effectiveness guidelines, interceptors and collection systems should be located on agricultural land only if necessary to eliminate existing discharges and serve existing habitation.
- "Primary and secondary impacts on agricultural land shall be determined, and mitigation measures recommended in environmental assessments and reviews and environmental impact statements of EPA decisions ...
- "Agricultural land protection efforts of states, local governments, or other federal programs shall be supported through intergovernmental coordination and EPA project reviews."

The SCS, which is concerned with maintaining the productivity of American agriculture, has a policy to make and keep current an inventory of the prime and unique farmland of the nation. The SCS and CEQ are currently conducting a national agricultural lands study to be completed in 1981. The study is assessing policy alternatives for agricultural land preservation.

State. In recognition of the need to preserve the state's agricultural resources, a preferential taxation scheme for agricultural lands was enacted in Ada County in 1971. Under the state law, agricultural land is taxed on current use value rather than market value. The tax assessment is based on income, a capitalization rate averaged over 10 years. To qualify for the preferential taxation program, a minimum of 5 acres under agricultural production is required. If the parcel is less than 5 acres, the farm must gross $1,000 annually or contribute 15 percent of the applicant's income.

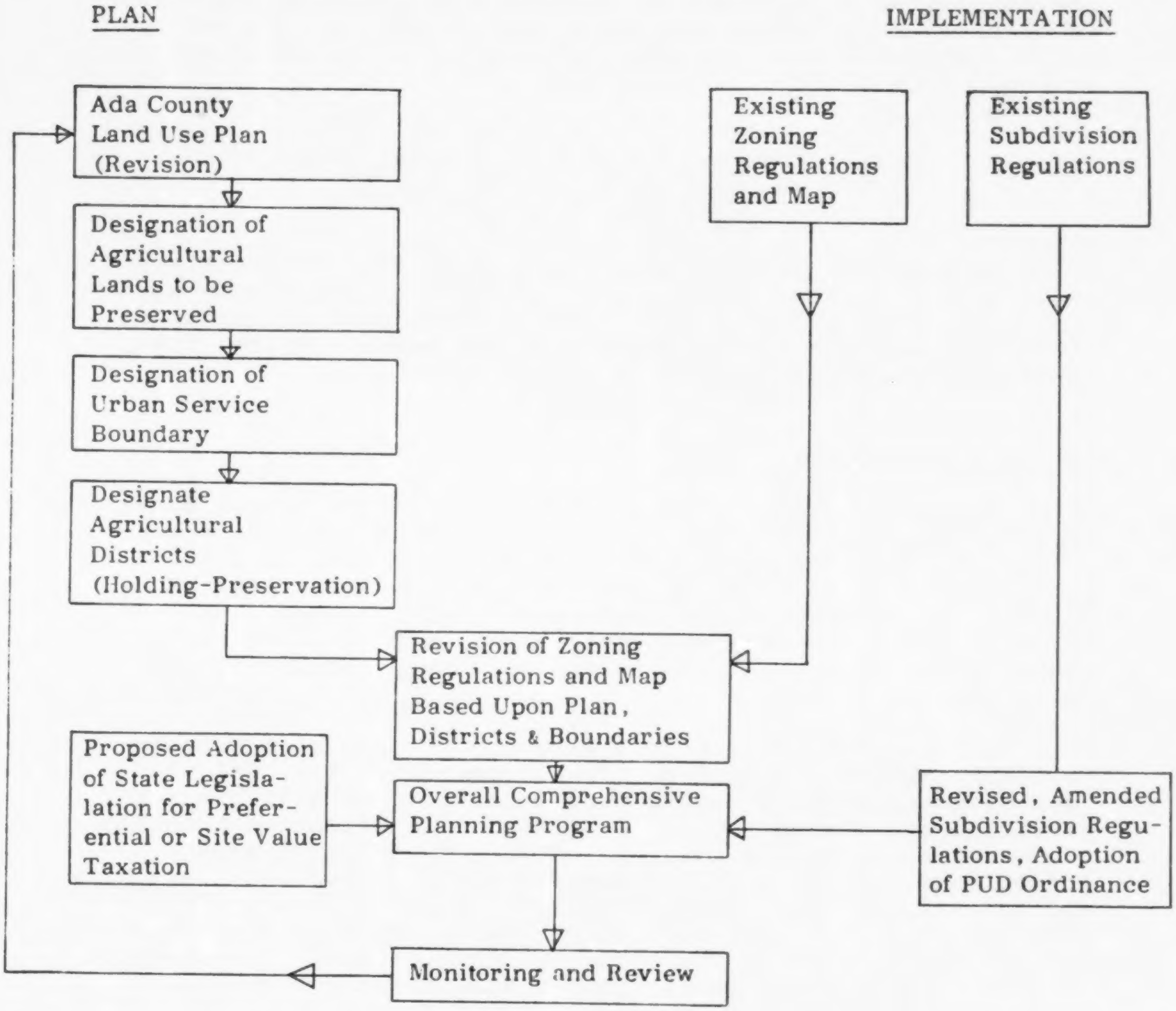
Peterson (1976) recently concluded a review of all state preferential assessment programs. The review found, with respect to retarding the conversion of farmland, preferential assessment is "marginally effective and its costs in terms of tax expenditures are high, in most cases so high as to render it an undesirable tool" for maintaining farmland and open space. The CEQ found that the principal effect of preferential assessment is to increase the profitability of farming by reducing production costs, but that preferential assessment affects neither the decision to sell for non-economic reasons (death or retirement) nor the major component of demand for land conversion -- the accessibility to urban centers.

In addition to the preferential assessment program, designated urban service planning areas differentiate future urban and rural areas. The urban service planning area designation is, however, only an indirect land use planning tool for preservation of agricultural resources. It must be augmented with additional land use controls to be effective.

Ada County. The preservation of agricultural land has received considerable attention at the county level from both the government and the public. Preservation of agricultural resources was formally recognized as an important public issue in Ada County with the formulation of goals, objectives and policies in the 1974 Ada County Concept Plan (ACOG 1975b). Since the concept plan was formulated, numerous preservation programs have been recommended. The framework for these programs is presented in Figure 12-2.

Of primary importance to Ada County's effort to preserve agricultural lands was the adoption of the Ada County Comprehensive Plan (Ada County Planning Commission 1977). This plan provides for agricultural preservation through development policies aimed at maintaining large agricultural parcels. The implementation of the policies has been provided through adoption of the amended zoning and subdivision ordinances. The effectiveness of the zoning ordinance to preserve agricultural lands will be reviewed later in this chapter.

Figure 12-2. Program for the Preservation of Agricultural Land in Ada County


PLAN
IMPLEMENTATION
Ada County Land Use Plan (Revision)
Designation of Agricultural Lands to be Preserved
Designation of Urban Service Boundary
Designate Agricultural Districts (Holding-Preservation)
Existing Zoning Regulations and Map
Existing Subdivision Regulations
Revision of Zoning Regulations and Map Based Upon Plan, Districts & Boundaries
Proposed Adoption of State Legislation for Preferential or Site Value Taxation
Overall Comprehensive Planning Program
Revised, Amended Subdivision Regulations, Adoption of PUD Ordinance
Monitoring and Review

SOURCE: ACOG 1975b.

It should be noted that a distinction between rural areas and rangeland exists in the policies of the county comprehensive plan. Although both designated areas should be considered significant to agricultural resource protection, designated rural areas are, as a rule, directly involved in the production of agricultural goods and therefore are managed more closely by the county.

Impact: Conversion of Agricultural Land to Urban Uses Through Provision of Wastewater Treatment

Each of the proposed wastewater treatment alternatives will affect to some degree the conversion of Ada County agricultural lands to urban uses. The effects will differ among the three wastewater treatment planning areas - Boise, the Southwest area, and Eagle.

Boise Planning Area

The Boise planning area, which corresponds to the Boise metropolitan area (excluding the Southwest area), has a significant amount of agricultural land. According to a 1975 analysis of vacant land in the Boise metropolitan area (ACOG 1975c), 39 percent of the land in the metropolitan area (including the Southwest) was zoned for either rural or rangeland use (all of this land is in the county portion of the metropolitan area).

Agricultural zoning in the county portion of the Metropolitan area involves three classifications: D-1, G-1, and D-2; lots or parcels must exceed 5 acres to be eligible for agricultural zoning. The D-1 and G-1 classification prohibit development of nonagricultural uses. Of the total amount of acreage in the rural and rangeland classification, only 13 undeveloped acres were zoned for D-1 or G-1 use (ACOG 1975c). The D-2 zone, defined as "farms lying in the unincorporated portion of the county which are likely to undergo a more intense urban development", includes the remaining undeveloped agriculturally-zoned acres, approximately 15,500 acres. This acreage represents a significant land reserve for urban expansion.

Although zoning is a potentially effective means of preserving farmlands, an analysis of vacant lands classifications in the county portion of Metropolitan Boise reveals that agricultural zoning may not be serving effectively as an agricultural land preservation tool. Rather, zoning has been more useful as a means of identifying transitional lands planned for future conversion to urban use. The Ada County Comprehensive Plan (Ada County Planning Commission 1977) and the wastewater facilities plan (CH2M Hill 1980c) recognize and are proceeding on the premise that the transition of agriculturally zoned lands from rural to urban use to accommodate projected growth in the Boise planning area will be likely to occur. The potential conversion of these farmlands is a significant impact to the area, and EPA believes that local planners should investigate mitigative measures that would lessen the impact. Potential mitigation measures are presented in the summary of impacts.

Southwest Planning Area

The Southwest area has a considerable amount of land currently under irrigation. The impact on these lands of future growth as projected in the Southwest community plan (Ada Planning Association 1980) is difficult to determine in the absence of site-specific development plans. The maximum development density adopted in the comprehensive plan (1 unit per 5 acres) does have, however, certain implications to the future agricultural production in the Southwest area.

The projected population increase in the Southwest area is 4,985 persons from 1979 to 2000 (Ada Planning Association 1980). Although this increase is relatively small from a total growth viewpoint, the impact on the future land use pattern will be significant. As a result of density limitations of 1 unit per 5 acres, the estimated minimum acreage needed to accommodate new growth would be 8,308 acres (at a density of 3 persons per dwelling unit). Such growth would require 79 percent of the total acreage in the Southwest area (10,500 acres). The impact on the agricultural land use pattern would be to reduce most large-scale agricultural operations to smaller scale "ranchette-type" farms. By reducing the size of existing agricultural operations to 5- and 10-acre farms, the economic value (based on diversity and economic efficiency) of agricultural activities would be diminished.

It appears, therefore, that the projected land use pattern based on existing density requirements will indirectly affect the economic viability of agricultural production in the Southwest area. As agricultural production is reduced in the Southwest area, additional pressures to convert small-scale farms to urban uses will likely result.

Eagle Planning Area

The future land use of the Eagle planning area is highly uncertain. With approximately 13,000 acres of irrigated cropland and rangeland within the Eagle area of city impact, development could have a significant impact on the agricultural resources of the area. The three population projections for the year 2000 are 10,225, 13,286, and 16,019; each projection has different implications to the conversion of agricultural resources. Assuming growth to 10,225 persons, sewers would be extended to include areas to the west; this development pattern corresponds to the current trend in population growth.

The higher population scenarios are dependent upon the annexation of the Middlebrook project. The Middlebrook project, as proposed, would consume 540 acres of some of the county's "most productive agricultural lands" (Blake pers. comm.). This development would include 250 acres for industrial park and 290 acres for residential uses, resulting in a population of approximately 16,000 by the year 2000. Without the industrial park, the population of 13,000 is projected.

At a minimum, 250 acres of irrigated cropland would be converted to urban uses with the construction of the Middlebrook residential development. With the addition of the industrial park, another 290 acres would be directly converted. Although the direct conversion of agricultural lands as a result of Middlebrook is substantial, the long term implications of residential development on adjacent agricultural resources are potentially more significant.

To realize any of these population projections, sewer services would need to be provided. The Eagle wastewater facilities plan will, therefore, facilitate conversion of agricultural land surrounding Eagle to urban uses. The amount of agricultural land which potentially would be converted depends on the population scenario that is selected for facilities planning.

Summary of Impacts

The present conditions for agricultural preservation in the study area portion of Ada County are unfavorable. In general, policies to retain agricultural resources through land use programs and control techniques do not appear effective. Development pressures are rapidly depleting the available supply of "close-in" irrigated croplands. Although additional major irrigation projects have been proposed for Ada County the environmental and economic costs are considered prohibitive (ACOG 1975b).

Although local land use plans recognize agricultural lands as a valuable resource, the proposed wastewater treatment system for the Boise planning area will permit and accommodate future growth at the expense of county agricultural lands. Even the low density residential development in the Southwest area will eventually limit the potential for protection of agricultural land. In accordance with its policy as stated previously, EPA encourages local planning officials to investigate and implement all possible mitigation measures to lessen the impact of conversion of agricultural lands. A list of potential mitigative measures is presented below.

Potential Measures Available to Mitigate the Loss of Agricultural Lands

Measures to mitigate the loss of agricultural lands can be grouped according to basic goals. The following list identifies six groups of possible measures which could mitigate the loss of agricultural lands in Ada County:

1) Measures Which Affect the Amount of Urban Development. Because urbanization of agricultural lands is a major cause of the loss of prime agricultural land, limiting the amount or urban development permitted would limit agricultural land losses.

2) Measures Which Affect the Density of Development. By increasing the density at which urban development takes place, the amount of agricultural land lost could be reduced.

3) Measures Which Affect the Location of Urban Development. The most direct approach to protecting agricultural lands is to allow development only on lands not suited for agricultural use, and to preserve all existing agricultural uses.

4) Measures Which Limit the Availability of Urban Infrastructure. Limiting expansion or extension of urban services such as roads, water, and sewers is one way of preventing urban encroachment on agricultural lands.

5) Measures Which Promote Agricultural Uses. Measures in this category represent actions which could be taken to strengthen the competitive position of agriculture and help it to gain better economic returns.

6) Measures Which Use Tax Policy to Protect Agricultural Uses. These measures use tax incentives to encourage agricultural uses or discourage urban uses of agricultural lands. Differential or preferential assessment of agricultural land is the single most commonly-employed approach to preserving agricultural lands, but the effectiveness of this approach is limited, especially when considering close-in agricultural lands (Peterson 1976).

Chapter 13

PUBLIC SERVICES AND FACILITIES

Wastewater planning for Boise, the Southwest area, and Eagle is based on 20-year population growth projects. Growth within the three areas will increase demands on key community services in addition to wastewater management. The objective of this chapter is to examine, in general, the capabilities of these other community services to accommodate projected growth. The following community services are considered: drainage, water supply, electricity and gas, solid waste management, schools, police protection, fire protection, and recreation.

Drainage

Among the public services provided to the cities and communities of Ada County, drainage is probably the most deficient. Further, the county faces a worsening drainage problem in unincorporated areas due primarily to lack of an effective mechanism to plan, construct and maintain adequate urban drainage facilities. The problem is particularly noticeable in the developing fringe areas, and is likely to respond adversely to continuing growth. Similar problems exist in the incorporated cities, including Boise.

The problem stems from: 1) the lack of an adopted areawide drainage plan, 2) the lack of consistent areawide drainage criteria, 3) the lack of consistent enforcement of drainage requirements concurrent with development, and 4) the absence of agencies funded to maintain existing drainage facilities.

The drainage problem is discussed in further detail in Appendix D. The Drainage Task Report prepared by Jones & Stokes Associates in February 1980 upon which this material is based, has been widely distributed and discussed at a workshop in Boise in March 1980. The report is available in the EPA district office in Boise.

Impacts

Increased sewage capacity and land use planning set the stage for additional development to occur. It is likely that a large number of retention ponds will be built, each serving an increment of development. Unmaintained ponds may cause nuisances, e.g., weed growth, increased mosquito populations, safety hazards, and failure to operate because of sediment and debris. Expensive underground storm drain pipes and concrete-lined channels may be required.

Mitigation Measures

The adverse impacts of new development within the physical and institutional environment related to drainage in Ada County can be mitigated by implementing a number of measures. EPA may consider these mitigations for inclusion as grant conditions on funding for the facilities covered by this EIS.

- Designate an agency, preferably the Ada County Highway Department (ACHD), (secondarily Ada County or thirdly a new entity) and possibly including the incorporated cities, to implement countywide drainage planning, facility implementation, maintenance and administration.
- Seek legislative clarification to provide full drainage authority and funding to the agency for all appropriate functions.
- Develop, adopt and implement consistent drainage criteria for storm drain design and for provision of flow routes for runoff from the 100-year event without property damage consistent with the National Flood Insurance Act.
- Prepare, adopt and implement drainage master plans indicating flow volumes for storm drain design and 100-year flood flows, and specifying facilities or concepts. The plans should provide for funding, and should involve a consistent approach to the separation or combination of storm drains with irrigation facilities.

Community Services

Water Supply

Boise. Boise's source of domestic water supply is groundwater. Both shallow and deep aquifers are used, with the shallow aquifer supplying individual wells and the deep aquifer supplying the community system. The Boise Water Corporation is the largest water purveyor in the Boise area, supplying some 90 percent of the total water supply (ACOG 1973b). Annual water demand in the Boise area in 1972 was 5,865 million gallons. Demand was projected to increase to 12,800 million gallons by 1992 (ACOG 1973b). Groundwater supplies appear adequate to meet the demands which will be generated by projected growth; the Boise planning area population is projected to increase to about 212,000 by the year 2000 (APA 1978). Additional wells, water storage facilities, and water distribution facilities will be necessary to meet future demands.

Southwest Area. The Southwest area depends on shallow groundwater for individual wells and deeper groundwater for community supply. About one-half of the 4,350 residential lots in the Southwest area receive domestic water from a community system; the other one-half rely on individual wells. The Boise Water Corporation supplies about 7,000 Southwest area residents, almost half the area's population. Small portions of the Southwest area are also served by the Ash Park Water Company and the South County Water Company.

Irrigation water is provided by the New York Canal which transports about 900,000 acre-feet annually (ACOG 1973b). Three irrigation districts supply irrigation water to the Southwest area, the New York district (serving 5,500 acres), the Nampa and Meridian District (serving 1,500 acres), and the Boise-Kuna district (serving 300 acres) (APA 1980).

Implementation of the "rural lifestyle" alternative for the Southwest area would increase the area's population to 18,985 (APA 1980). The Boise Water Corporation has not projected any major problems in serving this growth, but cautions that continued development using on-site systems should include a long-term operation and maintenance program to reduce the risks of groundwater contamination (APA 1980). Policies in the Southwest Community Comprehensive Plan (APA 1980) encourage existing residential developments with gross densities greater than one dwelling per five acres served by individual systems to connect to community systems.

Eagle. Eagle uses groundwater for domestic water supply and surface water for irrigation. Domestic water is supplied by individual wells and by the Eagle Ranch Water Company, which in 1977 provided well water to 300 customers (Eagle Planning and Zoning Commission [PZC] 1978). Irrigation water is provided by the Boise River and the Dry Creek Canal.

Population projections for the Eagle area project growth to between 10,225 (APA 1978) and 16,000 (with the 550-acre Middlebrook development). As the population increases, new wells and new water storage and distribution facilities will be needed. The study plan for the Eagle Water and Sewer district (J-U-B Engineers 1978) has policies to coordinate future growth with water supply provision, and to assure that expansion of water district boundaries is consistent with the boundaries delineated in the Eagle Sewer and Water Plan (Eagle PZC 1978).

Gas and Electricity

The Intermountain Gas Company supplies natural gas to all of Ada County. Natural gas in 1979 was distributed to 32,450 customers countywide through 821 miles of gas mains (McKinney pers. comm). Growth in Boise, the Southwest area, and Eagle will generate additional demands for natural gas; natural gas supplies appear adequate to meet these demands.

The Idaho Power Company supplies electricity to all of Ada County; its service area is 20,000 square miles in southern Idaho, eastern Oregon, and northern Nevada. The company mainly relies on hydropower for electricity generation, operating 16 hydro plants, in addition to a combustion turbine and sharing ownership in a coal-fired plant. Idaho power is currently developing an energy conservation program to slow growth in demand. Population growth in Boise, the Southwest area, and Eagle will create additional electricity demands. The long-term supply and demand outlook for electricity is uncertain.

Solid Waste Management

Most of Ada County's solid waste is disposed of in Hidden Hollows sanitary landfill, located about 5 miles north of the Boise city limit. The landfill in 1979 was receiving about 401 tons per day, and was projected to be at capacity sometime during 1980 (Boise Planning and Zoning Department 1979). Solid waste in Ada County is collected by private firms, the two largest of which are Browning and Ferris Industries and Boise-Ada Disposal Company.

A new landfill site is being considered to meet existing needs, as well as demands from future growth. Three sites are currently being considered: a site off Blacks Creek Road, a site on the first bench south of Gowen Road, and a site between Ten Mile and Eight Mile Creeks (Boise Planning and Zoning Department 1979).

Schools

Boise. The Boise School District currently operates 26 elementary schools, 5 junior high schools, and 4 senior high schools. Population growth in Boise will increase school enrollments and the need for additional schools.

Southwest Area. Most of the Southwest area is served by the Meridian and Boise School Districts, which together operate four elementary schools and one junior high. Presently, all schools in the Southwest area have student enrollments in excess of their capacity (APA 1979a).

Under the Southwest Community Comprehensive Plan "rural lifestyle" alternative, it is projected that one additional elementary school would be needed, but that the existing junior high would be sufficient to accommodate projected growth (APA 1980). Policies in the plan provide for developer dedication of land or payment of fees for the acquisition and development of school sites, but the feasibility of implementing these policies is questionable (APA 1980).

Eagle. Presently, the only school within Eagle is an elementary school operated by the Meridian School District; this school was over-enrolled in 1977. Junior and senior high school students are currently bused to schools in the Meridian area (Eagle PZC 1978).

Growth in the Eagle area will result in increased school enrollments, requiring new schools and increased school expenditures. According to the Eagle Comprehensive Plan (Eagle PZC 1978), two additional elementary schools and one high school would be needed to meet the enrollments which would be produced by a year 2000 population of 10,225. If a higher population projection of 16,000 were realized, additional school impacts would occur.

Police Protection

Boise is provided police protection by the Boise Police Department; the Southwest area and Eagle are served by the Ada County Sheriff's Department. Growth in the three planning areas will increase demands for police protection.

In the Southwest area, the current officer-to-population ratio is below the ratio of 0.67 officers per 1,000 population recommended in the Southwest Community Comprehensive Plan (APA 1980). By the year 2000, about five additional officers would be needed to meet this officer-to-population objective under the rural lifestyles alternative, at an annual cost of about $133,600 (APA 1980).

Fire Protection

Boise. The Boise Fire Department operates a number of fire stations, each intended to serve a 1.5-square-mile area. There is currently adequate fire flow within the city and response time is considered generally adequate (Boros pers. comm.). Additional fire stations may be needed to meet the fire protection needs of the growth projected for Boise.

Southwest Area. The Southwest area is provided fire protection by the Whitney Fire District which operates one fire station on Overland Road. Many portions of the area currently experience water supply or water pressure problems. The limited growth projected for the Southwest area under the "rural lifestyle alternative" probably will not require the construction of a new fire station (APA 1980). Policies in the Southwest Community Comprehensive Plan encourage provision of adequate fire flows in the future (APA 1980).

Eagle. Eagle is provided with fire protection by the Eagle Fire District, which is staffed by volunteers. Future growth to 10,225 would require an additional fire station to be built and the acquisition of additional equipment (Eagle PZC 1978). If the Middlebrook project were approved, residential fire protection needs would increase further, and special firefighter training and equipment would be needed to provide industrial fire protection.

Recreation

Boise. Two large community parks along the Boise River (Ann Morrison and Julia Davis Parks) provide regional recreation opportunities for Boise residents. Boise also has smaller numerous neighborhood and community parks. In the future, the Boise River "greenbelt" will continue to be the major focus of recreation in Boise, and additional parks will continue to be provided as Boise's population grows (Boise Planning and Zoning Department 1979).

Southwest Area. Currently, recreation facilities in the Southwest area are limited to a 5-acre neighborhood park. The Southwest area has mainly relied on county and City of Boise park facilities and on school playgrounds to satisfy recreational needs. Under the "rural lifestyle" alternative, an additional 31 acres of neighborhood parks would be needed but a new community park may not be needed (APA 1980).

Eagle. Eagle presently has no public parks, but is in the process of developing several small parks. The large population increases projected for Eagle will generate the need for more and larger parks in the future.

Mitigation Measures

In an effort to coordinate growth and the provision of public services, local agencies within the three planning areas have developed or are in the process of developing public services plans and policies. To the extent that these plans and policies are implemented, the potential adverse impacts of growth on public services will be mitigated.

If public services plans and policies are not implemented, local service deficiencies could result, but these are unlikely to be of sufficient magnitude to significantly affect the growth rates of the three planning areas. At this time, development of additional mitigation measures related to public services does not appear warranted as part of this EIS.

Fiscal Overview

Introduction

Between 1975 and 2000, Ada County is expected to more than double its population, growing from 139,400-289,000 residents. This growth, which wastewater facilities would in part accommodate, will require significant expenditures of both public and private funds in order to provide the services needed by present and new residents. One of the many underlying issues in considering regional growth relates to the ability of local public service agencies to pay for that growth.

Of particular concern is the effect of 1978 state Initiative One limiting property taxes to 1 percent of market value. At the present time, the fact that the Idaho State Legislature has not yet enacted a detailed program to implement the initiative both clouds the long run future and compounds the short run fiscal difficulties of local governments in Ada County.

This section summarizes existing fiscal conditions and the fiscal outlook for each of the four areas addressed by the wastewater facilities plan: Ada County, the City of Boise, the City of Eagle, and the Southwest area. A more detailed discussion of the existing fiscal structure and the fiscal outlook is included in Appendix B in this report.

Ada County

As a result of Initiative One and less construction-related fees, Ada County revenues have fallen short of earlier expectations. The county has responded by trimming some staff and services. If the current situation is prolonged, a reduction in nonmandated services is likely.

Looking beyond the immediate future, it appears that the county will be affected by fiscal constraints in terms of its future development policies. There will be a reluctance to permit discontiguous development, a closer evaluation of the public costs of new development, and review of policies to encourage new development to annex to existing municipalities and to obtain city rather than special district services. In general terms, the philosophy of the county will increasingly be to support municipal growth while unincorporated lands would be retained in rural uses. The implications of this approach in terms of the spatial distribution of growth are plain. Whether such a policy would also serve to inhibit growth is less clear.

City of Boise

Boise has felt the impact of Initiative One more severely than other jurisdictions because it operates on an accrual basis and because its property had already been revalued up to near the state-mandated limit at the time the initiative passed. Certain additional sources of revenues seem likely to be tapped in the future and Boise will likely continue to receive more state and federal funds, as a proportion of its budget, than do the other general purpose governments discussed.

The fiscal crunch has underlined the practicality of some of Boise's planning policies, particularly the preference for infill development in the southeast and (to a lesser extent) the northwest. This growth corridor is the most easily serviced by municipal agencies and in many cases the infrastructure to support new development in these areas is already in place. Growth elsewhere, particularly to the west and southwest, will be more closely scrutinized in the future, with: (1) fewer annexations, (2) preference given to contiguous development, and (3) a close tie-in between long-term physical development planning and capital improvement planning to assure efficiency and minimum public cost.

City of Eagle

The preliminary 1980 census indicates that approximately 2,600 persons currently reside in the City of Eagle. By the year 2000, the population is projected to increase to 13,286 (APA 1980). The projected growth in the Eagle area is not expected to decrease as a result of current fiscal problems primarily because the present and near-term scale of operation in the City of Boise will likely be quite modest. The present structure of urban service provision (most services are provided by special districts charging user fees) partially insulates the city from the more severe effects of Initiative One. Although much concern has been expressed over Eagle's future growth, it appears to be more of a regional planning concern than a potential fiscal problem. However, special districts providing services to portions of Eagle may encounter their own fiscal problems in extending services.

Southwest Area

Initiative One has been one important factor influencing the recent reassessment of future growth in the Southwest area. The cost of providing urban services to the dispersed developments that currently characterize the area, has proven to be higher than anticipated. These costs have contributed to the community's resistance to construction of public wastewater facilities.

The Southwest area is located in the unincorporated county and is served by a number of special service districts. As a result, the fiscal outlook for the Southwest area is difficult to assess. It does appear, however, that the combination of lower property tax revenues and an increasing awareness of the cost of urban services will result in slower growth than anticipated, at least in the near term.

Chapter 14

ARCHEOLOGICAL AND CULTURAL RESOURCES

Introduction

Section 106 of the National Historic Preservation Act requires the head of any federal agency with jurisdiction over a proposed federal or federally-assisted project to consider the impact of the project on sites, districts or structures included on, or eligible for inclusion on, the *National Register of Historic Places* prior to taking action on the project. The federal agency must also provide the Advisory Council on Historic Preservation the opportunity to review the cultural and historic implications of the proposed project prior to action.

Regulations implementing Section 106 identify the procedure for evaluating potential impacts on properties on or eligible for the National Register. This includes: 1) identifying properties within the project's area of impact that are on or eligible for inclusion on the *National Register of Historic Places* (this includes consulting the *National Register* and the State Historic Preservation Officer [SHPO]); 2) determining whether properties on or eligible for the *National Register* might be affected by the project; 3) determining if the effect is adverse; 4) notifying the Advisory Council and the SHPO of the findings of the impact analysis; and 5) proceeding with the consultation process if an adverse effect is anticipated.

The annual listings of historic properties appearing in the March 18, 1980 *Federal Register* and monthly supplements have been reviewed and the Idaho State Historic Preservation Officer (SHPO) has been contacted with respect to possible historic and cultural resources which may be affected by the wastewater treatment facilities proposed for the Eagle Water and Sewer District (EWSD) and the City of Boise.

Impacts

As a result of consultation with the Idaho SHPO and review of the annual listings of historic properties, EPA has determined that none of the alternatives evaluated for providing wastewater facilities for the EWSD and the City of Boise will affect any historic properties included in the National Register of Historic Places. In addition, it has been determined that there are no properties within the area of environmental impact that will be affected which are eligible for inclusion in the National Register.

In further consultation with the Idaho SHPO, the state archeologist has determined that there are no cultural resources located within the EWSD project area. This determination is based on an archeological field reconnaissance of the proposed construction site.

The proposed City of Boise wastewater treatment facilities have also been reviewed by the state archeological officer. The primary area of concern appears to be along the Boise River. Of the numerous archeological surveys conducted along the river, the only site found to date is a large trash deposit located in the Julia Davis and Ann Morrison Parks. Proposed interceptor alternative alignments will, however, run near the river; therefore, the state archeologist would like to periodically inspect the open trenches and dirt removed from them to record buried archeological sites and recover any artifacts found (see letters at end of this chapter).

Based on this request, EPA will require the City of Boise to provide access to Idaho SHPO representatives for inspection of trenches and excavated materials. This requirement will be included in a Step III (construction) grant condition. The state archeologist has concluded the proposed sludge pipeline will have no effect on any sites.

If any changes in proposed construction location associated with the proposed Eagle or Boise facilities should occur, the state archeologist will be notified and appropriate action taken to comply with Section 106.

COPY

January 21, 1981

Reproduced from best available copy.

Mr. [illegible]. Wayne Gibbs
Project Planner
J-U-B Engineers, Inc.
250 S. Beechwood Avenue, Suite 1
Boise, Idaho 83705

Re: Eagle Water and Sewer District

Dear Mr. Gibbs:

An archaeological field reconnaissance of the proposed construction site in the Eagle Water and Sewer District has been conducted. Since no cultural resources were found, this project should have no effect on any archaeological or historic sites. However, should there be any changes in the proposed construction location please consult with us further. Thank you for your cooperation.

Sincerely,

Thomas J. Green
State Archaeologist
State Historic Preservation Office

cc: Hal Bissell, Jones and Stokes Associates

COPY

December 22, 1980

Ms. Margaret L. Zimmerman
CH2M Hill
700 Clearwater Lane
Box 8748
Boise, Idaho 83707

Dear Ms. Zimmerman:

We have finally reviewed the maps you sent for the Boise Wastewater Facilities Plan. Our only area of concern is along the Boise River. We have conducted numerous archaeological surveys along the river and have yet to find any sites other than the large historic trash deposits in Julia Davis and Ann Morrison parks.

The sludge pipelines will have no effect on any archaeological or historic sites.

For the interceptors running near the river we do want to periodically inspect the open trenches and the dirt removed from them to record buried archaeological sites and recover any artifacts uncovered. No archaeological excavation or slow downs of the construction will be needed.

Sincerely,

Thomas J. Green

Thomas J. Green
State Archaeologist
State Historic Preservation Office

Chapter 15

SUMMARY OF SIGNIFICANT PROJECT RELATED IMPACTS

In this chapter the alternatives proposed for the City of Boise and the Eagle Water and Sewer District (EWSD) wastewater treatment projects are reviewed and the significant impacts of each are briefly discussed and summarized under a number of environmentally important headings.

These impacts are based upon an evaluation of the general nature of the proposed project alternatives. Where detailed routes have been identified for the location of interceptors and sludge pipelines we have drawn upon specific information provided in the facilities plans for Boise (CH2M Hill 1980a). See Figures 4-3, 4-4, and 4-5 for route names and locations.

Several issues remain to be more completely analyzed for the Final EIS. These include a fuller analysis of indirect impacts of growth relating to air quality, public services, and fiscal and employment factors in the communities involved. Also, more complete analyses of specific traffic and transportation patterns will be done.

Wastewater Treatment and Disposal Impacts

Boise River

Impacts. There should be no significant adverse impacts resulting to the Boise River from the proposed wastewater treatment plant at the Cities of Boise and Eagle, provided that the 1-in-10 year low flows used in the Boise facilities designs are actually implemented.

Residual chlorine levels in the Boise River will be decreased due to installation of dechlorination. Increased nutrient loadings to the Boise River may cause greater algal growth levels and greater dissolved oxygen sags in the lower river. The quantitative extent of the impact is not known.

Mitigation. The 1-in-10-year low flow used in designing facilities expansion needs to be assured in order that the receiving water quality criteria can be met. Detailed planning should not proceed until the flow issue is resolved

Growth Impacts

The proposed projects will provide capacity to accommodate growth. This growth will cause indirect impacts upon a number of environmental features. These impacts have been described in previous chapters and are summarized under the following environmental topic headings where relevant.

Air Quality

Impacts. Increased growth accommodated by improved wastewater treatment in the Boise area will result in deterioration of air quality. Estimates of future air pollution potential are presented in Table 7-9 which makes it clear that CO problems can be expected to persist at least to the year 2000 in several portions of the Boise Metropolitan Area.

To meet the 1987 deadline established by the Clean Air Act, projected 1987 emissions must be reduced by as much as 53 percent in some community planning areas, e.g., Central Bench, CBD and West Bench.

The analyses presented above have not included the effects of any vehicle inspection and maintenance program for Ada County. If such a program were implemented, projected vehicle emissions would be reduced by about 20-25 percent. This level of emission reduction would still be insufficient to provide for attainment of the 8-hour CO standard in the Central Bench, CBD, West Bench, and Warm Springs areas.

Mitigation. The APA is currently reviewing a number of additional measures which could be implemented to help achieve air quality standards through Ada County. These measures include:

- Improved public transit (short-term and long-term programs).
- Carpool/vanpool programs.
- Park and ride facilities.
- Traffic flow improvements through signalization programs, intersection design changes, added road lanes; many specific roadway and intersection improvements are already accounted for in the emission forecasts (see Appendix A).
- Exclusive bus and carpool lanes.

- Parking management programs (controls on the location and duration of on- and off-street parking; parking costs; supporting park and ride programs; facility design and operation; etc.).
- Controls on extended vehicle idling at drive-in facilities.
- Pedestrian malls.
- Improved bicycle facilities.
- Employer actions to support transit, carpool/vanpool programs, bicycle usage, flexible work schedules, etc.

These measures will require further study to determine the effectiveness of each measure to aid in the achievement of air quality maintenance standards.

Conversion of Agricultural Land to Urban Uses

Impacts. The proposed wastewater treatment systems for the Boise planning area will permit and accommodate future growth at the expense of county agricultural lands. Even low density residential development in the Southwest area will eventually limit the potential for protection of agricultural lands.

In accordance with its policy, as stated previously, EPA encourages local planning officials to investigate and implement all possible mitigation measures to lessen the impact of conversion of agricultural lands.

Mitigations. The following list identifies six groups of possible measures which could mitigate the loss of agricultural lands in Ada County:

1) Measures Which Affect the Amount of Urban Development. Because urbanization of agricultural lands is a major cause of the loss of prime agricultural land, limiting the amount or urban development permitted would limit agricultural land losses.

2) Measures Which Affect the Density of Development. By increasing the density at which urban development takes place, the amount of agricultural land lost could be reduced.

3) Measures Which Affect the Location of Urban Development. The most direct approach to protecting agricultural lands is to allow development only on lands not suited for agricultural use, and to preserve all existing agricultural uses.

4) Measures Which Limit the Availability of Urban Infrastructure. Limiting expansion or extension of urban services such as roads, water, and sewers is one way of preventing urban encroachment on agricultural lands.

5) Measures Which Promote Agricultural Uses. Measures in this category represent actions which could be taken to strengthen the competitive position of agriculture and help it to gain better economic returns.

6) Measures Which Use Tax Policy to Protect Agricultural Uses. These measures use tax incentives to encourage agricultural uses or discourage urban uses of agricultural lands. Differential or preferential assessment of agricultural land is the single most commonly-employed approach to preserving agricultural lands, but the effectiveness of this approach is limited, especially when considering close-in agricultural lands.

Public Services and Facilities

Impacts. The adverse impacts on public services from growth accommodated by wastewater facilities will be most significant in areas where the existing level of public service is currently deficient. In the Boise metropolitan area, the outlying areas are presently experiencing some public service deficiencies, primarily in police and fire protection and schools. In the Eagle area, adverse impacts on most public services will result as growth extends beyond the central city planning area. Additional medical care and hospital facilities will be required.

Mitigation. Existing Ada County and Boise policies should be implemented to avoid further compounding existing public service deficiencies. These policies encourage concentrating future development in areas already provided with public services, or in areas contiguous to serviced developments.

Urban service policies are implemented in part by designation of urban service planning areas in Ada County. Most residential, commercial, and industrial development is encouraged by the Ada County Comprehensive Plan to occur in urban service planning areas.

The policy plan for the Boise Metropolitan Area also uses the urban service planning area as a mechanism to coordinate growth and the provision of urban services.

Vegetation, Wildlife and Fisheries

Impacts. Accommodated urban growth will cause the greatest long-term impacts on wildlife. Conversion of open spaces in the foothills and on the plain to housing and industry will reduce the available habitat for many species. The bald eagle and long-billed curlew are especially vulnerable to disturbance.

Indirect impacts due to population growth will consist of increased sediment load, and higher flood peak flows from urbanized tributaries. Increased sedimentation of stream gravels will lower habitat quality conditions for trout and whitefish in the Boise River.

Mitigation.

Vegetation and Wildlife. Urbanization and recreation within or adjacent to Barber Pool should be planned to minimize bald eagle disturbance. Development, for example, should be discouraged near the cliffs used as roosting sites, and winter recreation should be directed toward the periphery of the pool, rather than through the middle of it. Similarly, development should be directed away from curlew nesting areas.

Fisheries. Implement drainage and runoff control measures to prevent sediments from growth-related development entering the streams and rivers.

Drainage

Impacts. Increased sewage capacity and land use planning set the stage for additional development.

A large number of retention ponds may be built to serve development. These may cause weed growth, increased mosquito populations, safety hazards and may fail to operate because of sediment and debris.

Mitigation.

- Designate an agency to implement countywide drainage planning, facility implementation, maintenance and administration.
- Seek legislative clarification to provide full drainage authority and funding.
- Develop, adopt and implement consistent drainage criteria for storm drain design and flow routes from 100-year flood runoff.

- Prepare, adopt and implement drainage master plan, specifying facilities or concepts, and providing for funding and a consistent approach to storm drain authorization with irrigation facilities.

Resource and Energy Use

Impacts. Population increases in the sewered area will use energy in the residential and transportation sectors and could stimulate consumption in the commercial and industrial sectors. The principal energy sources are natural gas, electricity, and petroleum fuels. Some geothermal energy is used for space heating in Boise, and many residences use wood as fuel.

Future trends in the availability and consumption of energy resources are difficult to predict. The local availability of energy will be closely related to regional and global trends in energy sources and supplies.

Mitigation. Institute energy conservation measures.

Traffic Congestion

Impacts. Population growth supported by increased wastewater treatment plant capacity will add traffic loads to the existing roadway system of the area. Roadway elements which currently experience significant congestion may be further impacted by additional development.

Mitigation. Develop local traffic plan considering air quality attainment standards.

Water Resources

Impacts. As additional agricultural lands in the Boise Valley are converted to nonagricultural uses the balance between nitrogen and salts loadings and the volume of water recharged to the aquifers will be adversely affected.

Under land use Plan C, rural lifestyle, it is expected that the Southwest Boise area will retain its rural characteristics for the foreseeable future. It is improbable that the anticipated growth will cause a major change in groundwater quality and quantity. However, further data are needed to ensure protection of public health and safety as growth occurs.

Mitigation. Regular monitoring of shallow and deep groundwater quality, preferably on a seasonal basis, should be carried out by an appropriate government agency to provide needed data for future planning and decision-making purposes.

The APA (1980) has developed a draft comprehensive plan which could provide the basis for a workable on-site waste management program.

Elements of this plan include:

- Determine causes of septic tank failures in rural Ada County.
- Modification of design criteria established by Central District Health Department (CDHD) to decrease the number of septic system failures.
- Establish and update map of rural Ada County which indicates location of septic system failures.
- Establish coordinated groundwater monitoring program.
- Develop public education program for residents and commercial establishments.
- Develop voluntary/mandatory maintenance program.
- Establish user fee schedule to fund program.

Public Health. There should be no significant impact upon groundwater or public health as a result of liquid sludge disposal as proposed and described in the Boise wastewater treatment facilities plan.

The sludge disposal method for the Eagle plant has not been described.

Construction-Related Impacts

There are many construction-related impacts which will be common to all the alternatives at both Boise and Eagle. These impacts relate to the general use of equipment and are chiefly in the categories of noise, dust, sedimentation, and traffic. Impacts may also include physical displacement or destruction of resources such as vegetation and wildlife.

The proposed projects involve modification or construction of facilities at several different locations in the Boise and Eagle area. The significance of construction-related impacts usually depends on site-specific conditions. Thus, the following discussions are organized in terms of project elements at different locations.

Noise, Dust and Erosion

Impacts. Figure 15-1 identifies noise levels by types of equipment which are typically used for construction and demolition. Most of this equipment will be necessary for implementation of the primary treatment improvements and pipeline construction. In addition to equipment used within the primary plant sites, vehicles related to construction operations will be entering and leaving the sites. Construction-related vehicles will include passenger vehicles for workers, materials transport trucks, and waste removal vehicles.

Plant site grading and excavation of facility sites and pipelines, demolition of abandoned facilities, vehicle movements on unpaved roads and parking areas, and handling of debris from construction or demolition will produce dust and expose soil surfaces to erosion. Dust generated by construction activities will undoubtedly be carried off-site on occasion.

South Boise Interceptors. Short-term adverse impacts upon recreational, green belt, and park areas will occur from the river north route, and upon a recreational area from the river west route. Short-term adverse impacts will result to residences along the Adams Street route, and to a recreational vehicle park near the river east and inland east routes.

North Boise Interceptors. Short-term adverse impacts will result to approximately the same extent from all four proposed North Boise interceptor routes.

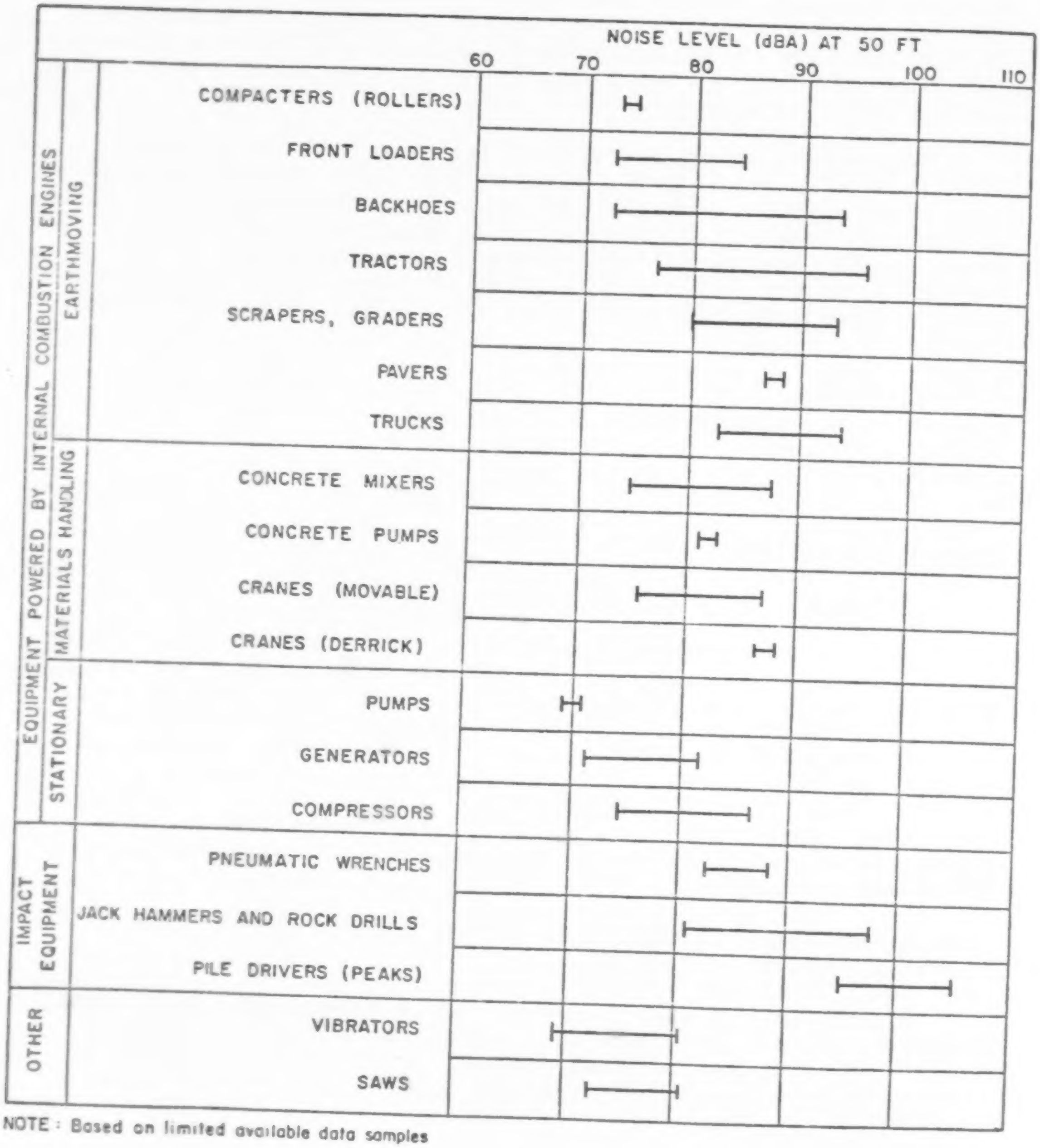
Eagle. No significant adverse impacts will result from the proposed treatment plant facilities and interceptor.

Mitigation. Noise can be minimized by requiring that all internal combustion engines be equipped with mufflers and baffles and be properly maintained. Construction operations should be limited to normal daylight working hours. Vehicles should carry full loads of materials and passengers to minimize trips.

Normal dust control measures should be followed during construction (water sprinkling or chemical treatments such as calcium chloride or light petroleum products for construction and parking areas). Disposal areas on agricultural land should be replanted soon after disposal of soil. Exposed areas and spoil piles should be watered down to prevent dust. Exposed areas which will be incidental to construction and not required for operations should be reseeded following construction, preferably with natural vegetation.

Figure 15-1

NOISE FROM CONSTRUCTION EQUIPMENT



NOTE: Based on limited available data samples

SOURCE: U. S. Environmental Protection Agency, 1971b.

Traffic Disruption

Impacts. Construction activities at the primary treatment plants will not directly block or otherwise disrupt traffic patterns on adjacent streets. Movement of construction equipment, construction materials, new facility equipment, and construction wastes could result in temporary reductions in traffic flow on area roadways. This would be most likely for trucks bringing over-sized loads to the plant sites (heavy construction equipment and new facility equipment).

Excavation and placement of interceptors and sludge pipelines will temporarily disrupt traffic. Trenching adjacent to or within agricultural areas will temporarily restrict access and movement of agricultural equipment. Pipeline routes will intersect roads, requiring an open cut across pavement. Motor vehicle flow will be temporarily detoured or restricted for jackhammer and trenching operations across roadways.

Mitigation. Trucks with over-sized loads should be routed to the construction site so as to avoid peak traffic periods and major local arterials. On-site parking areas should be provided for construction employees.

Vegetation and Wildlife

Impacts

Eagle. The proposed plant site is in one of the largest riparian communities along the river. Construction of the proposed Eagle facilities treatment ponds will eliminate a minimum of 15 acres of riparian habitat along the Boise River, in addition to habitat lost by buildings, roads, and pipelines.

Loss of the riparian habitat will reduce the wildlife population inhabiting the site, especially water-associated birds and mammals.

Alternative A (oxidation ditch) would cause a loss of riparian habitat.

Alternative B (pump to West Boise treatment plant) would destroy not only wildlife habitat of the site, but would destroy habitat over a distance of 19,000 feet during pipeline construction. This pipeline would cause significant impacts to a great blue heron rookery.

Alternative C (irrigation utilizing effluent) would destroy not only the riparian habitat at the plant treatment site, but would destroy up to 50 acres of wildlife habitat, depending upon location of storage ponds.

Alternative D (rapid infiltration with discharge to the river, lagoon and treatment plant) would destroy riparian habitat. Infiltration basins would destroy wildlife habitat.

Boise. Riparian habitat will be destroyed by certain of the proposed interceptor and sludge line routes which may be located near the river.

Of the proposed South Boise interceptor routes, the river north route would result in the loss of approximately 7 acres of riparian vegetation near river mile 51, near the Lander Street treatment plant, and in the Veterans' Memorial State Park.

The river west route would destroy more than 5 acres of riparian vegetation in a narrow strip along the river if located near the bank.

Both the Chinden and Adams routes would pass through areas already highly disturbed and there should be no significant impact upon vegetation.

The proposed North Boise interceptor routes would have significant impact only where Main A would cross Eagle Island and the river, and where Main E crosses the river. There would be fewer impacts from the other routes which generally are located on irrigated farmlands.

The greatest impact would probably be the crossing of Eagle Island which would disrupt vegetation and may disturb an active great blue heron rookery. Impact would be greatest during the heron and waterfowl nesting season (February through June).

Construction could conflict with bird hunting seasons in the fall.

The destruction of riparian habitat may generally be regarded as a potentially significant short-term impact. Vegetation will be lost, and associated animal life will be lost or disturbed.

The long-term impacts will not be significant if vegetation is reestablished.

However, if any of the corridor routes are used for other land uses, such as bikeways, then there would be a significant long-term adverse impact upon the wildlife due to elimination of habitat and to disturbance by humans.

Mitigation. Prior to any decision to provide federal assistance to the City of Eagle for wastewater treatment facilities, EPA and the City of Eagle will evaluate alternative sites that may either avoid or lessen the impact to the existing wetland. If, in its evaluation, EPA and the City of Eagle find that no other feasible alternatives exist, mitigation measures aimed at protecting the wetland will be proposed and coordinated with the U. S. Fish and Wildlife Service. The results of the evaluation will be included in the Final EIS.

Interceptor and sludge lines proposed for Boise should be located to avoid riparian habitat where feasible and the vegetation within the corridors should be restored.

Other land uses should not be established in areas where significant wildlife use exists, such as the great blue heron rookeries.

Fisheries

Impacts. There is some potential for significant impacts resulting from river crossings by interceptors and sludge pipelines. All of the Boise interceptor and sludge pipeline alternatives and the Alternative B of the proposed Eagle plan would require at least one river crossing. River crossings will result in temporary adverse effects on aquatic biota. Fall spawning runs of anadromous fish species may also be affected. Species will be displaced from the area of equipment operations, and sedentary species or fish eggs could be destroyed. Sedimentation from excavation and river bottom disturbance will affect fish, causing avoidance of silted waters and possible gill irritation. Insects which serve as food for fish will also be affected. Siltation will also cause smothering of fish eggs in downstream areas.

These adverse impacts are not expected to be significant if stream crossings are conducted as advised by the Idaho Department of Fish and Game and the U. S. Army Corps of Engineers. All stream crossings will require appropriate permits from the Idaho Department of Fish and Game and the U. S. Army Corps of Engineers.

Mitigation. Specific mitigation measures should be developed in consultation with the Idaho Department of Fish and Game and the U. S. Army Corps of Engineers. The Corps has issued a Nationwide General Permit for the placing of dredged or fill material for backfill or bedding of utility line crossings provided the following conditions are satisfied:

"a. The watercourse is returned to preconstruction bottom contours and all excess material is removed to an upland disposal area.

b. That the discharge will not be located in the proximity of a public water supply intake.

c. That the discharge will not occur in areas of concentrated shellfish production.

d. That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

e. That the discharge will not disrupt the movement of those species of aquatic life indigenous to the water body.

f. That the discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

g. That the discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State Wild and Scenic River System.

The following management practices should be followed to the maximum extent practicable to minimize the adverse effects of the discharge on the aquatic environment:

a. Discharges in spawning areas during spawning seasons should be avoided.

b. Discharges in wetland areas should be avoided.

c. Heavy equipment working in wetlands should be placed on mats.

d. Discharges into breeding and nesting areas for migratory waterfowl should be avoided."

Archeological and Cultural Resources

Impacts. No cultural resources have been identified at the proposed Eagle treatment site or along the proposed Boise interceptor or sludge pipeline routes.

Historic trash deposits have been found at Julia Davis and Ann Morrison Parks but these parks will not be adversely impacted by the project.

Excavations for proposed treatment facilities or pipelines have the potential for disturbing previously unknown historical or archeological sites.

Mitigation. Excavation in areas designated by the state archeological officer as potential sources of archeological artifacts should be conducted according to advice from professional archeologists. The state archeologist should be kept informed of the progress of the proposed project, and the opportunity provided for professional examination of excavated sites and materials (see Chapter 14).

Disruption of Effluent Flow

Impact. Disposal of effluent during phases of new construction of pipelines and other facilities could be impaired.

Mitigation. Adverse impacts may be avoided by retaining existing pipelines, pumping stations, etc., until new facilities are put into operation.

New pump stations, for example, may be built separately and tied into existing pipelines during periods of low flow in the system. Temporary storage within the pipelines and emergency holding ponds may be used as needed while the new facilities are connected to the existing pipelines.

Resources and Materials

Impacts. All of the proposed alternatives will require the irretrievable expenditure of energy and materials in the construction and operation of the wastewater treatment facilities and the interceptor and sludge lines.

Mitigation. Recovery of methane gas from anaerobic digestion to aid in operating equipment in wastewater treatment facility.

Reduce infiltration/inflow in sewer lines, and establish water conservation program (reduce pumping loads).

No-Action Alternative

Boise

If the proposed wastewater treatment plans are not implemented, the present water quality problems would continue, and projected population growth would have no sewer service, leading to possible additional water quality problems. In turn this would lead to detrimental impacts upon fisheries and recreational uses of the Boise River.

Increased growth without sewering could result in increased waste discharge to septic tanks with significant threat of pollution to area waters. A building moratorium may result from this threat.

Boise residents may be required to pay fines and suffer the loss of federal funds for public projects if NPDES standards are not met.

Eagle

If no action is taken to implement the proposed wastewater treatment plan, conditions would remain as they are, resulting in continuing violation of the District's NPDES discharge permit, and with no provision for improvement in quality of effluent being pumped into the Boise River.

With no plan implementation there would be no new impacts at the proposed site. However, adverse impacts of the existing system would continue, including those related to water quality and community growth limitations. Any new growth would have to rely upon on-site waste disposal systems, which would increase risk of water pollution and which would require low density land use with possible adverse economic impacts upon the community, and indirect adverse impacts upon fish and wildlife habitat.

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ACRONYMS AND ABBREVIATIONS

ACHD	Ada County Highway District
ACOG	Ada Council of Governments
APA	Ada Planning Association
BEA	Bureau of Economic Analysis
BOD	biological oxygen demand
BWQ	Bureau of Water Quality
$CaCO_3$	calcium carbonate
CDHD	Central District Health Department
CEQ	Council of Environmental Quality
cfs	cubic feet per second
CO	carbon monoxide
DED	Demographic and Employment Distribution
EIS	Environmental Impact Statement
EPA	U. S. Environmental Protection Agency
ESDI	Emission Source Density Index
EWSD	Eagle Water and Sewer District
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IPCo	Idaho Power Company
IWRB	Idaho Water Resources Board
lbs/ac	pounds per acre
MGD	million gallons per day
mg/l	milligrams per liter
mmhos/cm	millimhos per centimeter
N	nitrogen
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NH_3	ammonia
NOI	Notice of Intent
NO_3-N	nitrate measured as N
NPDES	National Pollutant Discharge Elimination System

OMB	Office of Management and Budget
ppm	parts per million
SHPO	State Historic Preservation Officer
SRMF	Stream Resource Maintenance Flow
SWIDD	Southwest Interim Development District Ordinance
TSS	total suspended solids
201	Section 201 of the Clean Water Act
208	Section 208 of the Clean Water Act
USGS	U. S. Geological Survey
USSCS	U. S. Soil Conservation Service
USPA	Urban Service Planning Area

EIS DISTRIBUTION LIST

Federal Agencies	Advisory Council on Historic Preparation
	U.S. Department of Agriculture Farmers Home Administration
	U.S. Department of Commerce National Marine Fisheries Service
	U.S. Department of Defense Corps of Engineers, Seattle District
	U.S. Department of Health and Human Services
	U.S. Department of Housing and Urban Development
	U.S. Department of the Interior Fish and Wildlife Service
	U.S. Bureau of Reclamation
	U.S. Department of Transportation Federal Highway Administration
Idaho State Agencies	Central Health District
	Division of Environment Air Quality Bureau
	Department of Fish and Game
	Department of Planning and Community Affairs
	Department of Transportation
	Department of Water Resources
	State Clearinghouse
Ada County	Board of County Commissioners
	Engineer
	Highway District
	Planning Association
	Zoning Department

City of Boise	City Council
	Planning & Zoning Department
	Public Works Department
Elected Officials	Honorable John Evans Governor of Idaho
	Honorable Richard Eardley Mayor, City of Boise
	Honorable Jerry Deckard Mayor, City of Eagle
	Honorable Joseph Glaysier Mayor, City of Meridian
Citizens Groups	Ada County Conservation League
	Ada County Medical Society
	Idaho Citizen's Coalition
	Idaho Historical Society
	Idaho Lung Association
	Idaho Water Users Association
	Idaho Wildlife Society
	League of Women Voters of Boise
	League of Women Voters of Idaho
	Soil Conservation Society of America
	Wilderness Society
Others	Bench Sewer District
	Boise Public Library
	Eagle Water & Sewer District
	The Idaho Statesman
	West Boise Sewer District

A local citizen mailing list is available upon request.

BIBLIOGRAPHY

Reference Documents

ACHD see Ada County Highway District.

ACOG see Ada Council of Governments.

Ada Council of Governments. 1973a. Ada County ecology: a reconnaissance survey with management implications. Environmental rep. no. 9. Boise. 140 pp.

__________. 1973b. Background information for Ada County, Idaho. Environmental rep. no. 3. Boise. 95 pp.

__________. 1975a. Land...nature's design for the future: a background report for consideration of regional land use alternatives. Boise. 56 pp.

__________. 1975b. Agriculture in Ada County. Boise. 32 pp.

__________. 1975c. Boise metropolitan area: statistical analysis of vacant land. Boise. 6 pp.

__________. 1975d. Boise River water quality monitoring. Environmental rep. no. 10. Boise. 69 pp.

Ada County Highway District. 1979. Annual budget, 1979-80.

Ada County Planning Commission. 1977. Ada County comprehensive plan. Boise. 16 pp. + maps.

Ada Data, Inc. 1979. Boise real estate research report of 1979. Prepared for Boise Real Estate Research Committee. 177 pp.

Ada Planning Association. 1978. Demographic and employment distribution to the year 2000. Boise. 198 pp.

__________. 1979a. Southwest wastewater management study, chapter 3: current conditions and characteristics of study area. Boise. 36 pp.

__________. 1979b. Ada County record subdivision report: summary points, July 1978 to December 1978. Memorandum from Robert Hugenberg, Executive Director, and Harvey Gross, Comprehensive Planning Director.

_________. 1980. Southwest community wastewater management study: operation and maintenance alternatives for on-site subsurface wastewater disposal systems. Boise. 42 pp.

APA see Ada Planning Association.

Arbib, R. 1979. The blue list for 1980. Am. Birds 33(6):830-835.

Boise (City). 1979. Boise city budget, 1979-1980.

Boise Center for Urban Research. 1977. Analysis of alternatives to refuse disposal. 97 pp.

Boise Planning and Zoning Department. 1979. Draft environmental assessment of downtown redevelopment program.

Boise Project Board of Control. 1979. Annual report, 1978.

Brown, C. J. D. 1952. Spawning habits and early development of the mountain whitefish (Prosopium williamsoni) in Montana. Copeia 1952(2):109-113.

Burt, W. H., and R. P. Grossenheider. 1976. A field guide to the mammals. 3rd ed. Houghton Mifflin Co., Boston. 289 pp.

Business Economics, Inc. 1976. An analysis of growth management fees in Ada County, Idaho. Prepared for Ada Planning Association Board and Idaho State Division of Budget Policy Planning and Administration. Boise.

Business Economics, Inc., and Benkendorf and Associates. 1978. 1978 housing study. Prepared for Ada Planning Association.

Caldwell, H. H., and M. Wells. 1974. Economic and ecological history support study for a case study of federal expenditures on a water and related land resource project, Boise Project, Idaho and Oregon. Idaho Water Resources Research Institute, University of Idaho, Moscow. 1[illegible]0 pp.

Carlton, N. H. 1969. A history of the development of the Boise Irrigation Project. M.A. thesis, Brigham Young University, Provo, UT. 138 pp.

Central District Health Dept. 1979. Southwest Boise water study, Boise, Idaho. Boise. 8 pp.

CH2M Hill, Inc. 1977. Urban runoff control handbook for Ada and Canyon Counties. Prepared for Ada/Canyon Waste Treatment Management Committee. 46 pp. + tables.

__________. 1979a. Mechanical treatment alternatives, City of Boise, Idaho, wastewater facilities plan. Prepared for the City of Boise. Technical memorandum, Oct. 1979.

__________. 1979b. Planning and design criteria, City of Boise wastewater facilities plan. Prepared for the City of Boise. Technical memorandum, May 1979.

__________. 1979c. South Boise interceptor extension route selection, City of Boise wastewater facilities plan. Prepared for the City of Boise. Technical memorandum, November 1979.

__________. 1979d. West Boise hydraulic capacity analysis, City of Boise wastewater facilities plan. Prepared for the City of Boise. Technical memorandum, September 1979.

__________. 1979e. Sludge management. Prepared for the City of Boise. Technical memorandum.

__________. 1979f. North Boise interceptor. Prepared for the City of Boise. Technical memorandum, September 1979.

__________. 1980a. Boise wastewater facilities plan: summary. Prepared for the City of Boise.

__________. 1980b. Flow augmentation and flow routing. Prepared for the City of Boise. Technical memorandum.

__________. 1980c. Wastewater facilities plan, Boise, Idaho, parts I and II: preliminary draft. Prepared for the City of Boise.

Costle, Douglas M. 1978. EPA policy to protect environmentally-significant agricultural lands. Letter from the Administrator, U.S. Environmental Protection Agency to Assistant Administrators, Regional Administrators, and Office Directors.

Davis, J. C. 1975. Minimal dissolved oxygen requirements of aquatic life with emphasis on Canadian species: a review. J. Fish Res. Board Canada 32:2295-2332.

Davis, J. C., _et al_. 1979. Dissolved oxygen. Pp.169-174 _in_ R. V. Thurston, _et al_., eds., A review of the EPA red book: quality criteria for water. Water Quality Section, American Fisheries Society, Bethesda, MD.

Dion, M. P. 1972. Some effects of land-use changes on the shallow groundwater system in the Boise-Nampa area, Idaho. Water info. bull. no. 26. Idaho Dept. of Water Administration. 47 pp.

Eagle (City). 1980. Statement of revenue for the quarter ended March 31, 1980.

Eagle Planning and Zoning Commission. 1978. Eagle comprehensive plan.

Eagle PZC see Eagle Planning and Zoning Commission.

Elrick and Lavidge, Inc. 1980. The Pacific Northwest residential energy survey, vol. I: executive summary. Bonneville Power Administration, Portland, OR. 81 pp.

ESL, Inc., and CH2M Hill, Inc. 1974. Ambient air quality measurements in the Boise, Idaho, urban area. Prepared for Idaho Transportation Dept. and Ada County Highway District.

European Island Fisheries Advisory Commission. 1979. Water quality criteria for European freshwater fish: report on ammonia and inland fisheries. EIFAC techn. pap. no. 11. 12 pp.

Gibson, H. R. 1978. Survey of fish populations and water quality in the Boise River from its mouth upstream to Barber Dam. Idaho Dept. of Fish and Game Snake River fisheries investigations job performance report, project no. F-63-R-4. 64 pp.

H. Esmaili & Associates, Inc. 1980a. Groundwater resources of Boise Valley, Idaho: preliminary draft. Prepared for Jones & Stokes Associates, Inc.

__________. 1980. Non-point source waste loadings in Ada County and southwest community study areas: preliminary draft. Prepared for Jones & Stokes Associates, Inc.

Henderson, D. M., F. D. Johnson, P. Packard, and R. Steele. 1977. Endangered and threatened plants of Idaho: a summary of current knowledge. University of Idaho, College of Forestry, Wildlife and Range Science bull. no. 21. 72 pp.

Holmgren, Arther H. 1972. Handbook of the vascular plants of the northern Wasatch. 4th ed. Intermountain Herbarium, Utah State University, Logan. 202 pp.

Idaho Air Quality Bureau. 1978. Staff report, Boise carbon monoxide study, winter 1977 - spring 1978, Boise, Idaho.

Idaho. Dept. of Employment. 1979. Selected Ada County employment statistics. Unpublished data from Research and Analysis Bureau, Boise.

Idaho. Dept. of Fish and Game. 1977. Habitat and species report, Ada County. Boise. 16 pp.

__________. 1978. A plan for the future management of Idaho's fish and wildlife resources, vol. I: goals, objectives, and policies, 1975-1990. Boise. 170 pp.

Idaho. Dept. of Fish and Game, and U.S. Bureau of Land Management. 1977. Sensitive species supplement to the master memorandum of understanding between the Idaho Dept. of Fish and Game and the U.S. Bureau of Land Management. Boise. 2 pp.

Idaho. Dept. of Health and Welfare. n.d. Rules and regulations for the control of air pollution in Idaho. Boise.

Idaho. Dept. of Water Resources. 1978. Ada County, Idaho: water-related land use. Boise.

Idaho. Division of Tourism and Industrial Development. 1977. Idaho almanac. Boise. 447 pp.

Idaho. Water Resources Board. 1974. Hydrology support study for a case study of federal expenditures on a water and related land resource project, Boise project, Idaho and Oregon. Idaho Water Resources Research Institute, University of Idaho, Moscow. 157 pp.

Jensen, Scott W. 1980. Wintering bald eagles of the Lower Boise River. U.S. Fish and Wildlife Service. Unpublished report. 9 pp.

Jones & Stokes Associates, Inc. 1980. Draft drainage task report: drainage planning and institutional evaluations. Prepared for U.S. Environmental Protection Agency. 51 pp.

J-U-B Engineers, Inc. 1978. Study plan for Eagle water and sewer plan. Nampa, ID.

__________. 1980. Draft step 1 wastewater facility plan, Eagle water and sewer district. Prepared for Eagle Water and Sewer District. Nampa, ID. 95 pp. + appendices.

J-U-B Engineers, Inc., and Barton, Stoddard, Milhollin & Higgins. 1973. Boise metropolitan area storm sewer system general plan. Prepared for Ada Council of Governments. Nampa, ID. 48 pp. + appendices.

Kennison, John A. 1980. [Status report of *Astragalus mulfordae*.] Oregon Natural Heritage Program, Portland. 16 pp. Mimeo.

Lewis, G. C., D. V. Naylor, J. R. Busch, and D. W. Fitzsimons. 1978. Groundwater quality study in the Boise Valley. Idaho Agricultural Experiment Station res. bull. no. 105. 30 pp.

McAffee, W. R. 1966. Rainbow trout. Pp.192-215 in A. Calhoun, ed., Inland fisheries management. Calif. Dept. of Fish & Game, Sacramento.

Mald, H. E., and H. A. Powers. 1962. Upper cenozoic stratigraphy of Western Snake River plain, Idaho. Geol. Soc. Am. Bull. 73: 1197-1220.

Mathematical Sciences Northwest, Inc. 1979. Estimating energy impacts of residential and commercial building development: a manual (draft). Prepared for U.S. Dept. of Energy.

Mink, L. L., A. T. Wallace, and M. G. Lucky. 1975. Study on the impact of subsurface sewage disposal in the Ada/Canyon County area of southwest Idaho. U.S. Army Corps of Engineers regional water management study. 61 pp.

Mohler, Levi L. 1974. Threatened wildlife of Idaho. Idaho Wildl. Rev. 26(5):3-5.

Moyle, P. B. 1976. Inland fishes of California. University of California Press, Berkeley. 405 pp.

Nace, R. L., S. W. West, and R. W. Mower. 1957. Feasibility of groundwater features of the alternate plan for the Mountain Home project, Idaho. U.S. Geological Survey Water Supply Pap. 1376. 121 pp.

National Fish and Wildlife Laboratory. 1980. Selected vertebrate endangered species of the seacoast of the United States. U.S. Fish & Wildlife Service. FWS/OBS-80/01.

Packard, Patricia L. 1979. Status report Allium aaseae. College of Idaho, Biology Dept., Caldwell, ID. 12 pp. Mimeo.

Peterson, R. T. 1961. A field guide to western birds. 2nd ed. Houghton Mifflin Co., Boston. 309 pp.

Peterson, Russell W. 1976. Subject analysis of impacts on prime and unique farmlands in environmental impact statements. U.S. Council on Environmental Quality, Washington, D.C. Memorandum.

Pruitt, T. A., and R. L. Nadeau. 1978. Recommended stream resource maintenance flows on seven southern Idaho streams. Instream Flow Info. Pap. No. 8. U.S. Fish and Wildlife Service, Ft. Collins, CO.

Snow, Carol. 1972. American peregrine falcon (Falco peregrinus anatum) and Arctic peregrine falcon (Falco peregrinus tundrius). Habitat management series for endangered species rep. no. 1. U.S. Bureau of Land Management Techn. Note. 35 pp.

__________. 1973. Southern bald eagle (Haliaeetus leucocephalus leucocephalus) and northern bald eagle (Haliaeetus leucocephalus alascanus). Habitat management series for endangered species rep. no. 5. U.S. Bureau of Land Management Techn. Note. 58 pp.

__________. 1974a. Spotted bat (Euderma maculatum). Habitat management series for endangered species rep. no. 4. U.S. Bureau of Land Management Techn. Note T-N-170. 13 pp.

__________. 1974b. Prairie falcon (Falco mexicanus). Habitat management series for unique or endangered species rep. no. 8. U.S. Bureau of Land Management Techn. Note T-N-240. 18 pp.

__________. 1974c. Ferruginous hawk (Buteo regalis). Habitat management series for unique or endangered species rep. no. 13. U.S. Bureau of Land Management Techn. Note T-N-255. 23 pp.

Staley, J. 1966. Brown trout. pp.233-242 in A. Calhoun, ed., Inland fisheries management. Calif. Dept. of Fish and Game, Sacramento.

Stebbins, R. C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston. 279 pp.

U.S. Bureau of Land Management. 1980. Snake River birds of prey environmental assessment: final. Boise.

U.S. Bureau of Reclamation. 1979. Boise Valley shallow groundwater study, first year review. 27 pp.

U.S. Bureau of the Census. 1977. 1974 census of agriculture. U.S. Government Printing Office, Washington, D.C.

U.S. Council on Environmental Quality. 1976. Untaxing open space: an evaluation of the effectiveness of differential assessment of farms and open space. Washington, D.C. 401 pp.

U.S. Dept. of Labor. 1979. Employment and earnings, 1909-1978. Prepared by Bureau of Labor Statistics.

U.S. Environmental Protection Agency. 1971a. Summary of water quality conditions, pollution sources, water quality regulations, Upper and Central Snake River Basins, Idaho-Oregon. Denver. 106 pp.

__________. 1971b. Noise from construction equipment and operations, building equipment and home appliances. Prepared by Bolt, Beranek and Newman.

__________. 1976. Quality criteria for water. U.S. Environmental Protection Agency, Washington, D.C. 256 pp.

__________. 1977a. Municipal sludge management: environmental factors. EPA 430/9-77-004.

__________. 1977b. Draft background paper on EPA programs and environmentally-significant agricultural lands. Washington, D.C. Memorandum from Office of Land Use Coordination, December 5, 1977.

__________. 1978a. Municipal wastewater treatment works construction grants program, state and local assistance, grants for construction of treatment works (Title 40, pt. 35, subpart E). Fed. Reg. 44022-22099 (Sept. 27, 1978).

__________. 1978b. Carbon monoxide study, Boise, Idaho, Nov. 25-Dec. 22, 1977, parts 1 and 2. Prepared by C. B. Wilson and J. W. Schweiss.

__________. 1978c. Idaho environmental quality profile, 1978.

U.S. Fish and Wildlife Service. 1973. Threatened wildlife of the United States. Washington, D.C. 289 pp.

__________. 1980. List of endangered and threatened wildlife and plants. 45 Fed. Reg. 33768 (May 20, 1980), as amended through July 14, 1980.

U.S. Soil Conservation Service. 1979. Soil survey of the Ada County area, Idaho. Boise. 327 pp. + maps.

Webb, D. 1958. Bioassay report, Boise River. Idaho Dept. of Fish and Game, Boise. File report.

Wilbur Smith and Associates, Inc. 1976. Demographic and economic base study, Ada County, Idaho.

Willingham, W. T., *et al*. 1979. Ammonia. Pp.6-18 *in* R. V. Thurston, *et al*., *eds*., A review of the EPA red book: quality criteria for water. Water Quality Section, American Fisheries Society, Bethesda, MD.

Zarn, Mark. 1974a. Burrowing owl (Speotyto cunicularia hypugaea). Habitat management series for unique or endangered species rep. no. 11. U.S. Bureau of Land Management Techn. Note T-N-250. 25 pp.

__________. 1974b. Osprey (Pandion haliaetus carolinensis). Habitat management series for unique or endangered species rep. no. 12. U.S. Bureau of Land Management Techn. Note T-N-254. 41 pp.

Personal Communications

Barker, L. S. December 18, 1979. CH2M Hill, Boise. Letter to C. R. Mickelson, Boise City Engineer.

__________. April-May 1980. CH2M Hill, Boise. Telephone conversations.

Berent, Mary. August 20, 1979. Data Technician, Ada Planning Association, Boise. Memorandum on Ada County recorded subdivision report and summary points.

Blake, Diane. May 1980. Ada Planning Association, Boise. Telephone conversation.

Boise Water Corporation. 1980. Well log and well-water quality data. Written and verbal unpublished data.

Boros, John. May 29, 1980. District Chief, Boise Fire Dept. Telephone conversation.

Federal Emergency Management Agency. January 1981. Telephone conversation with map identification facility, Bethesda, MD.

Fintel, Robert. January 1981. U.S. Army Corps of Engineers, Walla Walla, WA. Telephone conversation.

Howard, Rich. October 7, 1980. Threatened and Endangered Species Office, U.S. Fish and Wildlife Service, Boise. Telephone conversation.

Johnson, Margaret. May 1980. Planner, Ada Planning Association. Telephone conversation.

Keating, James. March 1980. Idaho Dept. of Fish and Game, Boise. Telephone conversation.

__________. July 14, 1980. Letter to Jones & Stokes Associates, Inc.

Kelley, Fenton. April 23, 1980. Professor of Ichthyology, Boise State University. Telephone conversation.

Leach, C. 1980. Idaho Dept. of Water Resources. Telephone conversation.

McKinney, ?. May 29, 1980. Vice-President of Marketing, Intermountain Gas Company. Telephone conversation.

Merhoff, L. A. July 23, 1980. Area Manager, U.S. Fish and Wildlife Service, Boise. Letter to Jones & Stokes Associates.

Minter, Bob. August 9, 1979. Environmental Planning Director, Ada Planning Association. Memorandum on urban storm drainage summary report.

__________. January 1981. Telephone conversation.

Murrey, A. E. 1980. Idaho Dept. of Health and Welfare, Boise. Letter to Bill Ancell, Public Works Superintendent, City of Boise.

Nadeau, Richard L. May 2, 1980. Fishery Biologist, U.S. Fish and Wildlife Service, Washington, D.C. Telephone conversation.

Neal, Dave. August 29, 1979. Ada County Environmental Office. Telephone conversation.

Parker, Tom. October 1, 1980. Wildlife Biologist, Idaho Dept. of Fish and Game, Boise. Telephone conversation.

Reid, Will. March 20, 1980. Fishery Biologist, Idaho Dept. of Fish and Game, Boise. Telephone conversation.

__________. April 1980. Telephone conversation.

Stacy, Susan. May 1980. Boise Planning Dept. Telephone conversation.

Steele, Robert. October 1980. U.S. Forest Service Intermountain Forest and Range Experiment Station, Boise. Telephone conversation.

Vickers, Kirby. 1981. Engineer, J-U-B Engineers, Nampa, ID. Telephone conversation.

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